THE BOOK of KNOWLEDGE

THE HEIR OF ALL THE AGES

In this beautiful painting, the artist, Mr. T. C. Gotch, has tried to picture the wonderful idea that a child of to-day is the heir of all the ages, inheriting all the treasures of learning and the achievements of the past.

The Book of Knowledge

The Children's Encyclopædia

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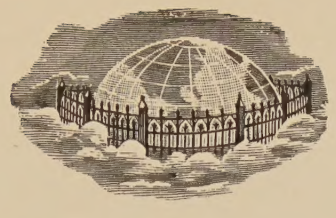

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Young Sailors Learning to Tie Knots at the Pelham Bay Station.

SHIPS AND SAILORS OF OUR NAVY

CONTINUED FROM 6202

IN another part of our book we have told you some of the stories of the United States Navy while it was small and weak. There are many other stories of bravery and skill which we did not tell, but we cannot find space for them all. They would entirely fill our book. Now we shall talk a little about our navy to-day, when it is one of the largest and strongest in the world.

The ships in which Perry, Decatur, Hull and the rest fought were sailing vessels built of wood. They carried a great many guns, more than the largest battleships do now, but these guns were small, did not carry far, and were not very accurate. One of the smaller battleships of to-day would destroy any number of the best wooden ships of the War of 1812. They could hardly get near enough to fire a shot, and if by chance they did, they could not do much harm.

THE FIRST BATTLE OF IRON SHIPS IN THE WORLD

You have read of the battle between the Merrimac and the Monitor in the Book of the United States. This was the first battle of iron ships in the world, and soon all the nations were building them. From this small beginning have come all the mighty battleships which cost so much money and can do so much harm.

Though the United States had a large fleet during the Civil War, after the war was ended the people wanted peace so much that the navy was neglected. It was thought that no foreign power would interfere with the United States, and the old wooden ships were allowed to rot. It had been found that vessels like the Monitor were not safe in a storm and few of them were built. For a time the United States did not have a single armored ship.

Men began to see that the United States would be helpless if attacked, and in 1883, Congress ordered four armored ships. Four more were ordered in 1885, and more ships were ordered every year after this. In 1890 Congress ordered three large battleships. Others were built later, and the work of the navy in the War with Spain convinced the country that we must have many more ships.

THE DIFFERENT KINDS OF SHIPS IN A NAVY

There are many kinds of ships in a first-class navy, used for different purposes. We often speak of the great gray battleships as if they were all. These battleships are very important, and they cost more than all the others together, but in any navy they are few, compared with the whole number. Besides the battleships there are usually cruisers of several kinds, scout ships, gunboats, destroyers, torpedo boats,

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submarines and submarine chasers, flying-boats, colliers, supply ships, hospital ships, and others.

Let us look at the United States Navy. First to be mentioned are the battleships. We had thirty-six of these at the beginning of 1917, and there are probably several more now, for the government has been building steadily for years. Some of these are old, and some are new. The newest ones are the most powerful, for they carry either more guns or else heavier ones. Such ships are several hundred feet long, and have very powerful engines which give all the newer ships a speed of twenty knots an hour, or more. The ship is protected above the water line by heavy plates of hardened steel, twelve inches or more thick. They have eight to twelve big guns, and a large number of smaller ones.

One of these great ships costs at least $10,000,000, and some of them cost much more. It costs thousands of dollars to fire its big guns. It carries a crew of several hundred men. Ships differ so much that it is hard to give exact figures which will be true for all of them. The battleships are named for the states of the Union, as Wyoming, New York, and Oklahoma.

Next come the cruisers. There are several kinds of them. Generally we can say that a cruiser has lighter armor and fewer guns than a battleship, but greater speed. The idea is to have a ship which can get to the point of danger quickly and will still have power enough to do damage to the enemy. Some of the cruisers are named for states, but generally they are called for cities, as St. Louis, Milwaukee and Charleston.

THE SWIFT DESTROYERS WHICH PATROL THE SEAS

One of the most important ships is called the destroyer, and got the name in a peculiar way. Years ago, when the torpedo first came into common use, small ships were built which fired torpedoes from the deck. Larger ships were built to fight the torpedo boats and were called torpedo boat destroyers. They carried torpedo tubes, and rapid fire guns also. They were so much superior to the torpedo boats that few of the latter are built now, but every navy has many destroyers.

The destroyers have no armor, but do have great speed. Some of them can make over thirty knots an hour. They are armed with three or four-inch guns, and carry torpedo tubes. They run errands, protect merchant vessels and look for mines and submarines. If they get the opportunity their torpedoes will sink a battleship. Their guns will smash a submarine, and if it submerges, they will drop a depth bomb into the water where it went down, or where they think it has gone. The depth bomb is a steel case containing explosives, which can be set to explode at any depth desired. As you know the pressure of water increases with the depth, and since experiments have shown the difference the bomb is set to explode at a certain pressure. This bomb may destroy a submarine even if it explodes some distance from it. The United States destroyers are named for the naval heroes, as Porter, Sampson and Cushing.

We have already told you about torpedo boats. Now we come to the patrol boats, or submarine chasers. They are really scout boats, and can do good work against the old-fashioned submarines. The newer submarines carry guns on their decks, which are sometimes heavier than those of the patrol boat, however, and could easily destroy it. But the patrol boats can be of much service in many ways.

We have told of the submarines and of the flying-boats in other stories in our book, and cannot tell more of them here. Every first-class navy must have both.

A battleship uses a great deal of coal, but does not have much room to carry it. So we have colliers which carry many tons, and meet the battleships at some place agreed upon, or else stay with the fleet except when a fight is expected. Formerly ships were coaled by taking on coal in small bags, but the new colliers use derricks and scoops. Some of the battleships burn oil, and for them there are oil ships.

There is not much room for wounded on a warship of any sort, and they can not be looked after very well. So hospital ships are fitted up, to take care of the wounded from the fleet. Some of them have every convenience that a good hospital would have.

Besides these which we have mentioned, many vessels are needed in a well equipped navy. It must have tugs, supply ships, and often a vessel is fitted up as a workshop, where repairs too difficult to be made on a fighting ship may be

ONE OF THE MOST POWERFUL BATTLESHIPS

The United States ship Arizona carries twelve 14-inch guns, and twenty-two 5-inch as a secondary battery, besides four torpedo tubes. The shells of the great guns weigh 1,400 pounds. The horse-power is 32,000 and it was designed to make twenty-one knots an hour. It is said that some of the ships now building will carry 16-inch guns, which will throw a shell weighing 2,100 pounds a distance of twenty-two miles. There are six other vessels in the United States Navy of about the same power as the Arizona. We show some pictures of a sister ship, the Pennsylvania, including the heavy guns, which are so formidable.

Pictures on pages 6205, 6208, 6209 from Brown Bros.

A LATTICE MAST ON A BATTLESHIP

The United States battleships have these peculiar masts, made of rods of steel bound together, which are seen upon those of no other nation. Ladders inside enable the sailors to climb to the lookout or to repair the wireless and do many other things. Note the two enormous searchlights near the bottom of the picture. They can make the spot upon which they are turned as bright as day.

Pictures on pages 6206, 6207, 6212, 6213, 6214, copyright by Underwood & Underwood, N. Y.

THE GREAT BATTLESHIP IS PREPARING TO DEPART

The Pennsylvania is getting up steam, preparing to depart. The engines are so large that this cannot be done all at once. Here you see the small boats stacked on the deck and one is hanging on the left. This is about the centre of the boat.

You see here a closer view of the derrick, which is lowering the tender into the water. It has been swung from its position on the deck and swung out over the water. A modern battleship is a very expensive mass of exceedingly complicated machinery.

During the Great War the United States built a great number of swift wooden boats for use against the submarine. They carried a small crew, a light gun, and a machine gun. Steel boats were built also.

Sailors are here shown painting the sides of the immense Pennsylvania. This was done before she was finished, but battleships are often painted.
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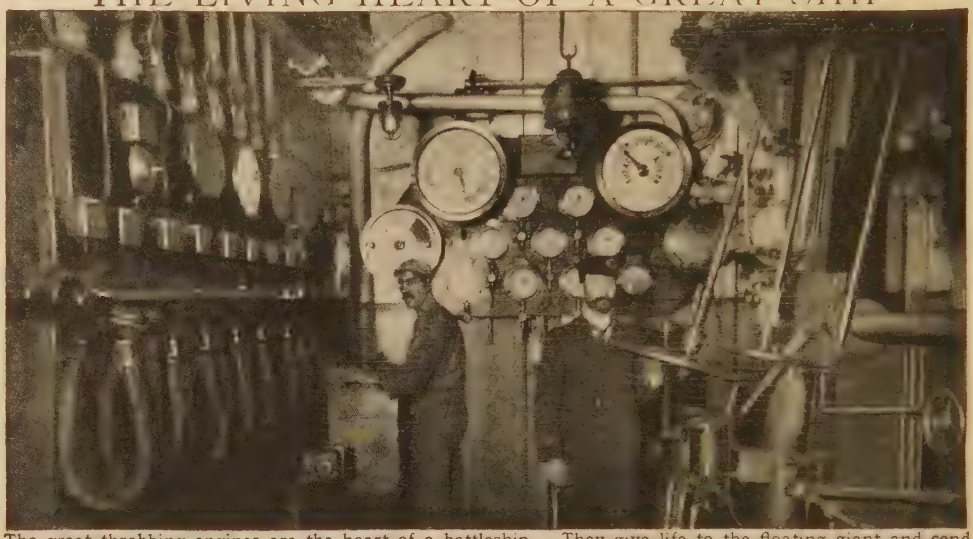
Here is a "mother ship" with two United States submarines lying beside her. The mother ship carries supplies, fuel, spare parts, and has a complete forge and workshop, where repairs to machinery can be made. This mother ship was an old monitor before it was assigned to its present duty. It carries two 12-inch guns but is not suited for regular ocean duty as it lies too low in the water.

ONE OF THE GREYHOUNDS OF THE SEA

Soon after the self-propelling torpedo was invented, many torpedo boats were built, but soon larger boats, called torpedo boat destroyers, took their places. This is one of many United States destroyers. It has a speed of nearly thirty knots, and carries four torpedo tubes and four 4-inch guns. Such boats are dreaded by enemy submarines, because of their speed and the accuracy of the fire of their guns.

Here we see sailors working on a torpedo, which is fired from the torpedo tube to the right. The explosive is in the nose of the torpedo, which we cannot see. The body of the torpedo contains the chamber for compressed air and the machinery which moves the propeller and guides it. The torpedo is shot over the side of the ship by compressed air, and then moves by its own power.

THE LIVING HEART OF A GREAT SHIP



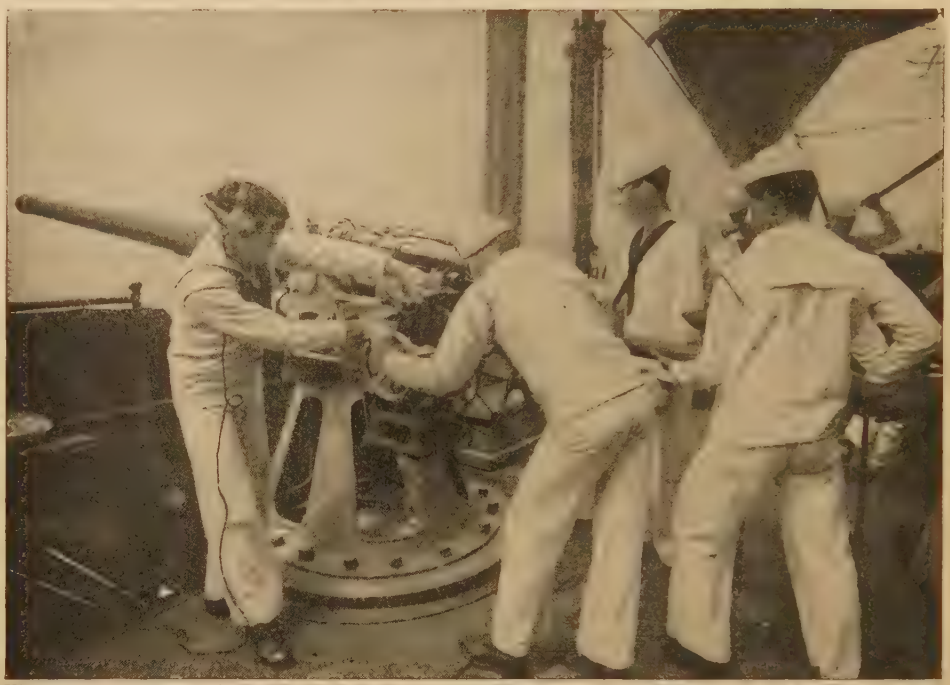
The great throbbing engines are the heart of a battleship. They give life to the floating giant and send it through the waves at the rate of more than twenty miles an hour. Here we see the engine-room.

The engines of the latest battleships do the work of over 30,000 horses, and when they are moving the furnaces must be fed This is the stoke-hole of a battleship, where the coal is shoveled into the furnaces.

The battleship must not only be watchful by day, it must be effective at night; in order to keep keen look-out for enemies, it is fitted with wonderful searchlights that can be flashed in all directions. These lights are of many thousand candle-power and reveal quite distinctly places and objects miles distant.

Magnificent and imposing as is a battleship by day, when its steel walls and powerful armament are plainly seen, it is, perhaps, even more impressive by night, when its massive outlines and sombre figure, only dimly to be perceived, are dark and ominous. Themselves almost invisible they can at any moment throw a powerful light upon their foes. The possibilities of these great fighting vessels are appalling.

BIG AND LITTLE GUNS ON A BATTLESHIP



While the chief power of a battleship is its heavy guns, they carry lighter guns, and the smaller ships, of course, cannot carry the heavy guns. Here we see the guns of small calibre being fired from a small ship. The sailor with the telephone at his ears is aiming the gun according to directions received from an officer above. One shell is in the gun and you see that two sailors each have another ready.

So far no United States ship has carried larger guns than fourteen-inch. They are arranged three in a turret, which can be turned. Here you see six of the twelve heavy guns on the Pennsylvania. They throw shells weighing 1,400 pounds. Five hundred and fifty pounds of powder is required to send out these missiles. Some countries have ships with eight fifteen-inch guns, and the United States is experimenting.

DAILY ROUTINE ON A GREAT BATTLESHIP

Sailors do not often come very close to the enemy, for most naval battles are fought at a distance of several miles. However, it may be necessary to land a party sometimes for various reasons. The sailors therefore are drilled in the manual of arms, exactly as soldiers. Here we see a part of the crew of a great battleship being drilled on the deck, by the officer in the background. Some of the sailors are curious.

Everything about a battleship must be kept scrupulously clean since so many men must live in a small space. Even the decks are washed and scrubbed every day until they shine. Here we see the sailors whose turn it is to do this work, making the deck so clean that one could eat from it. The effect of the light and the wet deck makes a very attractive picture, which the sailors probably do not notice as they work.

done. One or more of these will go with every fleet.

Now who are the people on the battleship? Let us first take the officers. In our story of Annapolis we told you that the young graduate was appointed an ensign. This corresponds to the second lieutenant in the army. Next in rank is junior lieutenant, equal to first lieutenant in the army, while lieutenant corresponds to captain. Next comes lieutenant-commander, corresponding to major, and commander, corresponding to lieutenant-colonel in the army. The captain in the navy is equivalent to the colonel in the army.

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The food served on the ships is always good, but on holidays and special occasions extra attention is given to the bill of fare. Young men almost always improve in health while in the navy. Here you see the cooks preparing for Thanksgiving. A great quantity of everything is required to feed several hundred hungry men.

Above the captain the ranks are rear-admiral, vice-admiral, admiral, and admiral of the navy. There are many petty officers and warrant officers, which correspond in a general way with sergeants and corporals in the army, though their positions are more important in some ways and they get more pay.

A sailor enlisting in the navy for the first time must be between seventeen and thirty years of age, and must be able to read and write English. He may enlist as a seaman, or for work at the particular trade he knows. A battleship is a great mass of complicated machinery, and blacksmiths, carpenters, machinists, shipwrights, steamfitters, plumbers, electricians, and the like are needed. Yeomen are the clerks. Hospital attendants, druggists, cooks, bakers, etc., are also needed.

When a young man enlists he is usually sent to a training station for a few weeks or months. Here he learns the drill, the great lessons of obedience, neatness and promptness, and begins to learn his duties. Many things on a ship are not done the same way as on land. The sailors sleep in hammocks, which are rolled up out of the way in daytime. The tables from which they eat, are often swung up to the ceiling to get them out of the way when not in use. Every inch of space is precious, and the same room must be used for several things. Each sailor has a box with a lock in which he may keep any small thing he prizes. His clothes are kept in a strong bag and every article must be folded and rolled in a particular way. An officer frequently inspects the bags, and the young recruit soon learns to be orderly.

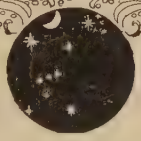
Enlistment in the navy gives many young men a better education than they would get outside. Classes are held on shipboard in time of peace, and besides a young man may learn a trade which will enable him to make a good living when his term of enlistment has expired. In addition he sees the world, gets good food and clothing, and learns habits which will be of use to him in after life.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 6259.

When we say that we can see a man in the moon we mean that the shadows seen in the left picture look like the eyes, nose, and mouth of a man ; but in the right picture, which shows the moon as seen through a telescope, our artist shows us how we may get a very much clearer image of a man in the moon by merely emphasising a few of the lines that are really in existence.

WHO IS THE MAN IN THE MOON?

CONTINUED FROM 5996



FANCYING that we see faces or figures in the moon is rather like playing the game of pictures in the fire. At times we can certainly imagine that we see a great face in the moon, though we change as we grow older, and the writer of these words, who used to see the face very clearly when he was a child, has not seen it for many years—probably because he is looking for something else.

At any rate, there is no doubt that there are markings on the moon, and that in proportion to the moon's size they are very large, and many of them very high. We can prove that they are so by measuring the length of the shadows which they throw upon the moon's surface when the sun's light catches them sideways. These markings are partly what we must call mountains ; they are partly, perhaps, in the nature of creeks, or clefts, and the most remarkable and beautiful of them look like craters of huge volcanoes. These are very large and have very high sides, as we can see when the sun shines sideways upon any of them. It is these craters, above all, that help us to see the man in the moon, or the little old woman gathering sticks, or whatever else people have thought they could see there.

There remains, however, a deeply interesting question which astronomers are now studying keenly. Are these craters really craters, and was the moon's surface really once covered with gigantic volcanoes? Some argue that things are indeed what they seem on the surface of the moon, and that the volcanoes were very large because the moon is so small. That sounds curious, but the explanation is that the moon, being small, would cool very quickly, and if it cooled very quickly and shrank very quickly its volcanoes would all be on a large scale.

But other astronomers are beginning to say that perhaps these markings never were volcanoes at all. They argue that the moon has no atmosphere to act like a great protective blanket or like the armor-plate of a ship, as our atmosphere does, and that the effect of meteorites, or shooting stars, falling upon the moon

would therefore be very serious. They argue that, at a certain stage in the moon's history, when its surface was much softer than it is now, pieces of rock, or whatever we like to call them, flying about in space and striking the moon at a tremendous rate might produce those effects which we now imagine to be craters. If this is true, the "marks" are not really craters at all, but are mighty scars, or holes, punched in the moon.

HOW DOES A GYROSCOPE WORK?

A gyroscope is very like a top. Indeed, it is only a very heavy and carefully-made top. It usually takes the form of a wheel with a heavy metal rim, and this is held or enclosed in such a way that if it is set spinning it can do so freely. Of course, any spinning thing tends to slow down, owing to the resistance of the air, and the friction where it is supported—unless, like the earth, it does not spin on anything. So by various means a gyroscope may be made to go on spinning, and then we can observe its behavior in all sorts of conditions.

It has been learned by men of science that mere motion will give resistance and force and all the properties of hardness and rigidity to things which had not these properties before. This is true of the gyroscope. Its spinning motion gives it the power to resist very firmly anything that tends to alter the direction of its spin. The heavier the gyroscope, the greater will be the amount of motion in it when it spins, and the greater its resistance to any force that tries to alter the direction of its motion.

Therefore, a railway car may run safely on a single rail without tilting over, simply because it carries a spinning gyroscope, spinning so fast and made so heavy that its tendency not to be disturbed or tilted will prevent the car from tilting.

WHY ARE CHILDREN FOND OF DOLLS?

Some people have said that children are not fond of dolls because they are dolls, but because they are possessions. These people declare that the secret is found in the liking which children have to possess things, just as grown-up people have the same liking, and that children will become quite as fond of anything else that is theirs as they will of a doll.

But those who really know anything of children know a great deal better than this. They know that, as a rule, a child, at any rate during several years of its life, is far fonder of a doll than of anything else, and that the child is more pleased with the chance to nurse a real baby. So the truth is that the love of dolls is really the mother-instinct and the father-instinct showing themselves already, even in little girls and boys.

Often little boys are told that they should not play with dolls, but with soldiers. One little boy, who had not been taught such nonsense, had his doll out with him in the street, and some big boys cried out and jeered at him. But the little fellow had a good reply. He turned round and said, "None of you will ever be a good father."

WHY DOES A HEN CACKLE AFTER LAYING AN EGG?

Of course this is not an easy question to answer, for we cannot ask a hen why she cackles, and indeed, if she could speak, she could not give a reason; for this act, like many of our own, is not a reasonable one, but simply a consequence of the way in which a hen is made. It is what is called an instinctive action. Yet we can understand it because we can compare it with actions of other creatures about which there is no doubt.

The doing of anything which we were meant to do gives us pleasure. The bodies of living things are constructed in this way, as we might well expect. Now, pleasant feeling in ourselves and in other creatures often excites the body to some kind of activity, as when we say that a person sings for joy. When we feel very pleased with ourselves we want to sing, or whistle, or dance, or do some such thing. It is a question of what is called the expression of the emotions. A dog has the advantage of us in one respect, because it has a tail, and when a dog is pleased, it not only gives a special bark, which is its way of singing for joy, but it also expresses its emotion by wagging its tail. On the other hand, an angry lion will sway its tail from side to side, and express its anger in that way.

So when the hen cackles after laying an egg, it is simply her way of singing for joy. Her body and her feelings have

the satisfaction of having done something which her body is meant to do. It is probable that the actual laying of the egg causes discomfort, and there is a corresponding feeling of ease and satisfaction when the task is done.

WHAT ARE "BLIND-ALLEY" OCCUPATIONS?

A blind alley is a road along which one can go for a certain distance, and then no farther. We have to go back and make a fresh start, and we have lost all our time. And so we now give the name of "blind-alley" occupations—a name which every boy should know—to those which seem to offer a road to somewhere, but lead a boy nowhere, waste years which he can never regain, and perhaps even destroy his power to learn something better afterwards.

All who have studied the subject know how important this question is, and boys and girls should all be warned in time of the consequences of going into a "blind-alley" occupation. A boy leaves school at fourteen or sixteen, and can at once get employment which brings in a few dollars a week, but which teaches him nothing. For instance, this may be the case with telegraph boys, as we all may see. After a few years, when the boy is beginning to become a man, and to expect a man's wages, he is, instead, turned off to make room for a younger boy. Since his "blind-alley" occupation has taught him nothing, and has only given him time to forget what he learned at school, he has to seek unskilled and poorly-paid labor, and often can get no work at all. Many scores of thousands of boys and girls in our country are now in these "blind-alley" occupations, and the time has come when we must put an end to a process which causes so much harm. It injures the boys and girls themselves, and it afterwards only too often makes them a burden upon the nation, instead of part of its real wealth.

WHY CAN'T LIGHT TURN A CORNER?

There are several ways in which light can be made to turn a corner, but it is true, and it is one of the most important facts about light, that it naturally travels in straight lines. This does not mean that the light from a lamp travels only in one direction. It travels equaly in straight lines in all directions, and since it is a property of light to travel in straight lines, of course it cannot turn a corner by itself.

But fortunately there are many ways in which light can be made to turn a corner, for there are many ways in which rays of light can be bent or turned. By means of a mirror, or any surface which reflects light at all, light can be made to turn a corner, or any number of corners, so long as at each there is placed a reflecting surface. In just the same way, of course, a ball can be made to turn a corner.

Light can also be readily made to turn a corner by what is called refraction. This is the name given to the bending of a ray which in passing from one thing to another, as from air to water, or air to glass, becomes, as it were, cracked.

WHAT IS A CYNIC?

The word cynic is simply the Greek for *dog-like*, and means a person who has rather a snarling and dog-like kind of temper; at least, that is supposed to be the origin of the name. The great argument of the cynics in ancient Greece was that men must give up luxury and beauty, and even cleanliness, and any kind of decent human comfort. As we can imagine, they were not pleasant people, though it cannot be denied that they showed much courage and suffered much discomfort. One of the most famous of the cynics, pretending to be very humble, used to show himself in a cloak full of holes—a perfect instance of what has been called "the pride that apes humility." This particular cynic lived in the time of Socrates, who said to him, "I see your vanity peeping through the holes in your cloak."

WHICH IS THE BIRD WITH THE LONGEST TAIL?

We all know that the peacock's tail, which is so beautiful when opened out, is very long when it is closed up; but there are some birds in Japan that have tails as much as twelve feet long, and when they walk about in the open air special train-bearers support their tails, so that the feathers may not be dragged through the dust and dirt. These birds are a variety of the barndoor fowl. In the same way pouters and fantail pigeons have been developed in Europe from the common pigeon. The long-tailed cocks are reared at Shinowara, a village in the island of Shikoku. That they

may not damage their tails they are kept in high, narrow cages, lighted at the top.

The bird naturally remains on the perch at the top, its tail hanging gracefully down. It is seldom allowed outside its cage, and then it walks in the open air for about half an hour, followed by its tail-bearer. Occasionally it is washed in warm water, and allowed to dry its feathers in the sun.

For traveling, special long, narrow boxes are used, and the feathers are bent as little as possible. The root of the tail in these birds is much stronger than it is in an ordinary cock. Even the feathers on either side of the body grow to an enormous length, and hang down with the tail feathers to a depth of three or four feet, so that the tail has the appearance of being not only very long but also very bushy.

A Bird's Tail 12 Feet Long.

WHY DOES A LEVER MAKE A WEAK MAN STRONG?

In the case of all levers and pulleys the principle is the same. No form of lever or pulley makes power out of nothing. The secret lies somewhere in the special way in which the power is applied to the weight which it has to move.

If we think of a simple case of a man using a long iron rod to dislodge a piece of rock, by pressing the rod, near its lower end, against something firm, we shall see that the two ends of the lever—that is, the rod—move through very unequal distances in the same time. We can see this for ourselves by holding a pencil across the edge of anything, with nearly all the pencil on one side. Then, if we tilt it up and down, one end moves through a very much smaller distance than the other in the same time. The more unequal the two arms of the pencil, the greater is the difference between the distance moved by the two ends of the pencil.

That is what happens when a man is levering up a stone. He has not strength enough to move the lower end of the lever by pressing there, but he can get the necessary movement there by spending his power over a greater distance at the top end of the lever. Less power is required there, but it is required to act through a greater distance. So the work is done, and the law that power cannot come from nowhere holds good in this case as it does in all others, no matter if it does seem otherwise.

WHERE WERE THE FIRST LIGHTHOUSES BUILT?

It is difficult to think of a time so far back that there were no lighthouses to guide the sailor on the pathless sea and protect him from dangerous reefs, shoals and cruel rocks. No doubt the very first lighthouse was the light set in the window by the fisherman's wife to bring his boat safely home. And today, we have lighthouses whose flashing or revolving lights can be seen for many miles at sea and which protect the dangerous coasts all over the world.

It is said that the first lighthouses were built in that oldest of countries, Lower Egypt, but it is so long ago that no one knows just when. These early timers were very crude. The fuel was placed in a large pot and hung from the end of a pole which projected from the tower like the flagpole from a window. The first regular lighthouse built to guide sailors was stationed on a cape of Asia Minor, in the Troad, and a Greek poet 660 years before Christ mentioned it, so we see that this poet gave us something

more valuable than his poetry, which no one ever reads.

WHY IS A LIGHTHOUSE CALLED A PHAROS?

One of the most famous lights of history is the Pharos of Alexandria. It was built of white marble and stood on the island of Pharos at the entrance of the great harbor. From its summit, 400 cubits above the sea, an immense beacon fire of wood could be seen for thirty miles. It was completed 280 years before Christ, in the reign of Ptolemy Philadelphus, and was one of the Seven Wonders of the World. It took its name from the island on which it stood, and after that date Roman lighthouses were spoken of by this name, "pharos." This beautiful structure, 100 feet on a side built in terraces, lasted for 1,600 years, until destroyed by an earthquake. The lighthouses at the English port of Dover, and the French port of Cologne, were built by the Romans and were supposed to be the first lighthouses ever built in Western Europe. The Colossus of Rhodes, another one of the Seven Wonders of the World, may also have been a lighthouse.

The earliest lighthouse which was built on a rock in the ocean, swept by waves, and which is still standing, was built at the mouth of the Gironde River in France. The Cardouan Light was begun in 1584 and finished in 1610, but earlier towers are said to have been built upon this very rock by Louis le Debonnaire about 805, and later by Edward, the Black Prince. The light which shone from this tower was at first made by the burning of an oak log, and later by a coal fire, which was lighted in an open basket or grate, called a "chauffer."

To-day "the light that shines over the sea" is of many kinds. It is made by electricity, by a kind of gas called acetylene gas, and by oil gas, which is largely used in the United States and England. Oil for this purpose is brought to the lighthouse in large iron tanks and stored in a room near the entrance, and from there it is pumped up into the lantern. By means of lenses, prisms and reflectors, the rays which would naturally turn upward or downward are thrown out in a horizontal line. The electric light of Heligoland, an important island in the North Sea, is equal to the enormous number of forty-three million candles, and the Highland Light at Navesink has sixty million candle power, and flashes its light a distance of twenty-eight miles over the water.

WHICH IS THE OLDEST LIGHTHOUSE IN THE UNITED STATES?

The oldest lighthouse in this country is the Boston Light, which has been shining from Little Brewster Island ever since the year 1716. Some one may ask whether it is the very same lighthouse which was built then, but a little thought will answer that question, for we know what power there is in the winds and waves beating constantly against the rocks to wear them away, and a lighthouse would be far more easily destroyed than solid rock. The lighthouse which stands on the island to-day was built in 1819. During the Revolution it was destroyed and rebuilt no less than three times.

WHY ARE LIGHTSHIPS USED INSTEAD OF LIGHTHOUSES?

The most famous lighthouses in the world are built miles out at sea and the task of building such a tower in these dangerous places is one to awe the stoutest heart and tax the utmost skill. And there are many places where no lighthouse can be built on account of the terrific force of the wind and the waves and the strength of the currents. These reefs or treacherous shoals or sunken rocks are protected by lightships. One of the best known in this country is the Ambrose Channel Light, off Sandy Hook. The lightship off Cape Hatteras guards the dangerous Diamond Shoal. There is another at the Nantucket Shoal, and many more all along the New England coast. All these ships are equipped with wireless telegraphs, which is a safeguard to the ships.

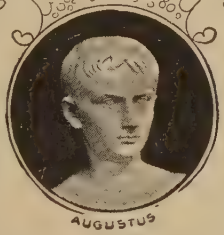
There are lonely spots where no man could live without the danger of losing his mind, and here lights are stationed, called "unattended lights," because they are worked by wonderful clockwork devices, and no one goes near them for periods varying from three months to a year. The light burns all the time or is lighted at regular hours by mechanism, or, more wonderful still, by a Swedish invention which makes use of the sun. As the sun rises and sets, its increasing or decreasing light works a valve which controls the flow of the gas so that the light begins to shine after sunset and goes out after sunrise.

THE FAITHFUL SENTINEL OF POMPEII

When the city of Pompeii was overwhelmed by burning ashes and destroyed, a brave soldier stood at his post to the last, watching death come towards him. When, 1,700 years after, the diggers found the ruins of the city buried in the earth, they found the soldier's body lying where he had kept watch. Sir Edward Poynter has painted this picture of the sentinel who was "Faithful unto Death," and it hangs in the Liverpool Art Gallery.

WHAT I SAW AT POMPEII

CONTINUED FROM 6189



NOTHING will live longer in the mind of a visitor than this city of a vanished life, a sight to look upon with doubting eyes even as you walk through its streets and sit down in its houses; but something almost beyond belief, when, afterwards, you fill in all that you have seen of this city which passed out of the world in a night.

There are mightier ruins in the world than Pompeii, things bigger to look at, things bigger in history, things that stir the mind more in themselves; but nowhere is there so great an area of ruin so well restored to its former appearance as this.

Here is a city nearly two miles round, with streets of houses, with market-places and shops, with gardens and squares and monuments; all so well preserved that if the tenant of one of these houses were to come back to life, and were set down at one of the three gates of Pompeii, he would walk along the old pavement he helped to wear down over 1800 years ago, and would walk to his house quite naturally, and perhaps recognize his old home, in some cases, by still fresh paintings at the gate. He would find the mosaic floor still almost as new in many of his rooms; he would find beautiful statues still unbroken; he would find the pipes which brought water to his bath still in their place; he would find the bath still capable of holding water; and he would find things at home in such a condition that no power would make him believe that his home had been buried in the earth over 1,700 years. It is difficult to think of anything so hard to believe as Pompeii. Every little detail has been preserved. Here, in a kitchen, is a pan on the fire, resting on the ashes which were boiling water more than fourteen hundred years before the discovery of America.

It is this which makes Pompeii almost too true to be true—the preservation, through all that dread catastrophe, through all these nineteen centuries, of *the very life of the moment when Pompeii heard its doom.*

The architecture of this vast ruin is

wonderful. The freshness of some of the color is as if it were done yesterday. The sense of luxury is everywhere, and there is even a sort of atmosphere that comes up from the long ago. But the miles of ruin, the well-planned houses fit for kings, the famous frescoes and mosaics, which are in some cases our only picture-record of historical events, are, with all their value and their tremendous interest, not the most impressive fact of Pompeii. Pompeii is unmatched as something preserved through nearly twenty centuries, preserved in big and in little so that identity is easy; but Pompeii is unique in the world because it has stamped for ever upon the earth itself the life of a single moment in the dim mists of Time. Remember, a moment; not a period, not a day, not even an hour —but a *moment*, for one may see the pan boiling on the fire, the loaf of bread half eaten, the meat being cooked for dinner, the wine still in the bottle, the ink still in the pot, the key still in the door.

A mosaic in the floor of a doorway in Pompeii, with the words Cave Canem, "Beware of the dog."

You may visit the cellar where sixteen people hid themselves when the calamity came, where the master of the house was found with the key in his hand, a slave close behind him with money and valuables. Outside is the courtyard from which they must have fled.

You may even see the pain on a man's face as he died on that terrible day. There were no cameras to take photographs then, but Nature can do without cameras.

In the ashes where they lay, the features of these poor people were pictured as in a photograph; the ashes hardened so that the likeness was preserved through all the centuries; and when these bodies were discovered there came to Signor Fiorelli a wonderful idea. Removing the bones carefully, he filled the space with plaster, making a perfect image of the figure which had lain there, hidden from sight for more than a thousand years. And here to-day lies the image of a man who died in that terrible ruin, his face wrought with the very pain of death. Not all the destructiveness of Vesuvius, not all the weight of the earth for nineteen hundred years, has changed a muscle of this dead man's face, and his image lies here to-day that all the world may see something of that awful moment when a great city vanished from the earth. Near by him lies the image of a dog. And here, near the homes in which they lived, lie images of other men and women —men and women no longer now, but only forms, statues that Michael Angelo or even a greater than he never could have rivaled.

It is almost tame, after this, to think of all the wonderful things the guide would show you if you allowed a guide to hide the interest of Pompeii from you, as guides do; but there are three wonders of Pompeii. There is the wonder that it should ever have been built, so rich in art, so poor in vision; there is the wonder that so much of it has been preserved from so tremendous a destruction; and there is the wonder that it should have been lost hundreds of years and found again.

It must have been an interesting city in ancient times, and there is no wonder that Rome flocked here to live its lighter life, that an emperor and statesmen and poets and nobles had houses here. And what houses they were, occupying a whole street sometimes, lavish in paintings and marbles. It is odd to stand at the gate of one of these houses and look at the mosaic in the floor, a picture of a dog, with the old *Cave Canem*, "Beware

HOW A CITY WAS SEALED UP BY A STORM

THE BEAUTIFUL CITY OF POMPEII, AS IT LAY HIDDEN FOR NEARLY 2,000 YEARS

No more terrible fate ever happened to a city full of life and gaiety than that which befell Pompeii, with its splendid buildings—temples, palaces, baths, and theatres—in which were stored many treasures of art. On the morning of August 23, in the year 79 A.D., it must have been a brilliant sight to see. But within a few days Pompeii and the neighboring city of Herculaneum, lay buried, to be remembered only in name for the next seventeen hundred years. Mount Vesuvius, which had been sleeping for centuries, woke up suddenly in the year 63, and caused an earthquake that destroyed a great part of Pompeii. The people rebuilt the city, and had almost finished it when a still more terrible calamity overtook them. The mountain poured forth a storm of burning ashes, which fell upon the city and buried it completely. Then heavier cinders poured forth from the mountain and sealed it up, as shown in this picture.

POMPEII COMES OUT OF THE EARTH AGAIN

Pompeii, buried for more than seventeen hundred years, has in the past century been brought to light, and here we see it as it is to-day. Here are streets and pavements, houses and shops, theatres and temples, law-courts and market-places, in which we can walk about as the old Romans did.

This shows one of the main streets of Pompeii, which has been completely unearthed. The curb-stones and stepping-stones, paths and roadway, are exactly as in the days of the Emperor Titus. Nearly all that we know of Roman life and manners has been revealed by the discoveries at Pompeii.

BEAUTIFUL COLUMNS COME TO LIGHT

This is the Basilica at Pompeii. The word basilica comes to the Romans from the Greek and means either a court of law or a sort of merchants' exchange. In form it was a long rectangular hall supported by great columns. Later both the word and the kind of building were borrowed for churches.

The view of the ruins of Pompeii given on the preceding page was taken from above, and does not show the open spaces shown in this, which is even more interesting, if there can be said to be degrees of interest in this marvelous city. Notice how clearly the beautiful fluted columns stand out. Soon after the destruction of the city, the ruins were reached by tunneling down through the lava, and many valuable objects were removed. Then the people went away, and the ruins were forgotten. Photographs from Brown Bros.

of the dog," under it; and it is wonderful to stand in the garden of another house, with flowers growing now where they grew then, with lovely little statues still unbroken where they were first set up, with the gateway still fresh with paintings, with color everywhere, and with people moving to and fro, and to imagine to yourself that the lord of the house is giving a party and you are among the guests. No great imagination is called for at Pompeii, for if imagination did not people these houses and these streets the very stones themselves would cry out. One thing you must do, however, before you go to walk about these streets of destruction: you must go upstairs and downstairs in the museum in Naples, where what is left of all that was beautiful and all that was useful in Pompeii is gathered together. Here is a collection that must stir the dullest mind that ever wandered mechanically about a great museum. Here are the marbles—frescoes, statues, columns, tombs—that made Pompeii a beautiful place to walk about in.

A PAN STILL ON A FIRE IN A KITCHEN IN POMPEII, AFTER BEING BURIED 1800 YEARS

Hundreds of pieces crowd the ground floor of this museum, most of them in marble or in bronze, and most of them from the villas and temples and streets and spaces of this stricken city. No corner of Pompeii was left unadorned; it is astonishing to see the splendid friezes in the arcades, where things were bought and sold: even the butcher and the fishmonger, with their benches next to an emperor's temple, carried on their unlovely work in an artistic environment. It is not easy to understand how rich this place must have been until you have seen the museum, because it has been the habit in the past to carry off the art treasures of Pompeii to Naples. The city itself is to-day without roofs, like a city after a great fire has done half its work, with beautiful things left only inside houses and courtyards.

For, of course, the treasures of Pompeii can never be brought together again. How much of this artistic wealth must have been destroyed in that year 79! How much was carried off by the inhabitants, who tunneled underneath the lava ashes to find their treasures. How much lies still buried in the earth, waiting for the spade to bring it into the light of day! Only half, perhaps, of this field of ruin has been recovered since the work of excavation began in the eighteenth century. Men are still at work digging up houses and gardens and marbles, and nobody knows whether there may be a new piece of

A HOUSE IN POMPEII—AS IT WAS AND AS IT IS

The wealthy noblemen of Rome had beautiful palaces at Pompeii, to which they went in the hot summer months, just as people go to their country houses nowadays for a vacation. Here is the atrium, or drawing-room, of a fine house in Pompeii. The house belonged to a man named Cornelius Rufus.

Here we see the same room as it appears to-day. In the middle is a marble water-basin, let into the floor and surrounded by mosaics, and on the margin are the supports of a rich marble table. Rooms opened out all round, and in the distance can be seen the remains of the peristyle—an open court.

sculpture, or some beautiful fragment of mosaic.

For hundreds of years this great treasure-house was unknown to the world, for the ancients left it covered up when they had taken from the ruins all that they thought it contained, or all that they thought worth digging for. But Vesuvius spat out dust enough to bury Pompeii nearly twenty feet deep, and so it happened that the ancients robbed the surface only, leaving the depths to be trampled down or built over or neglected throughout the Middle Ages. Then a farmer would dig up a piece of marble, and perhaps it would be a man's hand. A peasant found a piece of cloth as he dug his garden one day, and used it to clean out his oven. It did not soil, it did not burn—because it was a piece of asbestos cloth in which some ancient Roman had wrapped the ashes of a dead friend!

A PAVEMENT LAID ON A STREET IN POMPEII OVER 1800 YEARS AGO

Coming to Pompeii by train, the traveler sees green orchards with stone columns rising among the trees, filling the mind with wonder as to what lies beneath. We come, too, upon whole fields black with lava, which remind us that even while men dug up one civilization Vesuvius covered up another.

The busy spades and pickaxes, which have revealed to the eyes of men this vanished city, have brought up out of the earth much more than a collection of marbles. The ground floor of the Naples Museum is filled with monuments, but come upstairs and see *a hundred thousand things*. That is not a guess, or a mere general number; there are, indeed, a hundred thousand things, counting coins and brasses and everything brought out to the light of day to show us the life of these people of long ago.

Here are the things with which they beautified their homes—little bronzes for the mantelpiece, hundreds of pictures from their walls, lovely vases of every kind. Here are locks and keys, and every sort of thing still used in a kitchen; pots and pans, and salt-cellars, and scales, and bottles, and knives; things for boiling twenty eggs at once; little stoves; actual beds that people slept on, chairs they sat in; stocks they put their prisoners in, in which four skeletons were found; safes for their valuables; pens they wrote with; ink still in the bottle, though now dried up; and even doctor's instruments made of bronze.

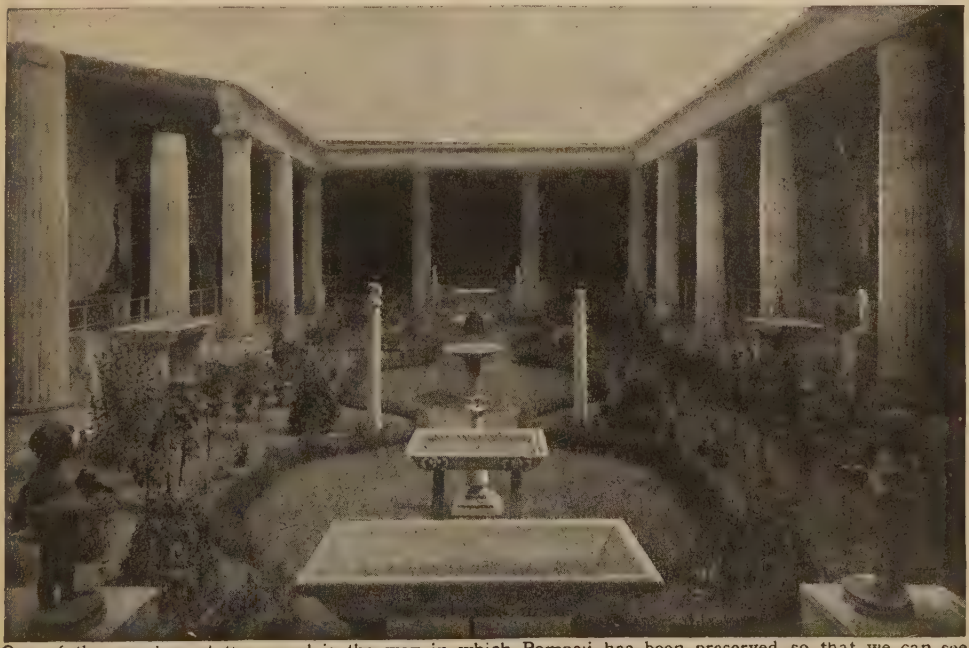
In one room are the cakes that were on the table when the calamity came, a loaf half cut, meat in a saucepan ready for cooking, peas, beans, prunes, raisins, fruits ready for dessert. Everything to eat seems to be in the room, fragments from the last dinner-tables of Pompeii, preserved through all but two thousand years by Mother Earth. And there is one thing you will not believe. There is an egg—*unbroken!* Think of it! Vesuvius destroyed this city, drove off its population, cut off at least 2,000 lives, all in an hour. It buried the city under thousands and thousands of tons of dust, buried it in the earth through all the years while Europe has been made. Vesuvius could do this, yet could not break an egg!

Pompeii is something to see and never to forget, for no other work of man's hands has ever been buried in the earth and come out so wonderful.

CONTINUED ON PAGE 6329.

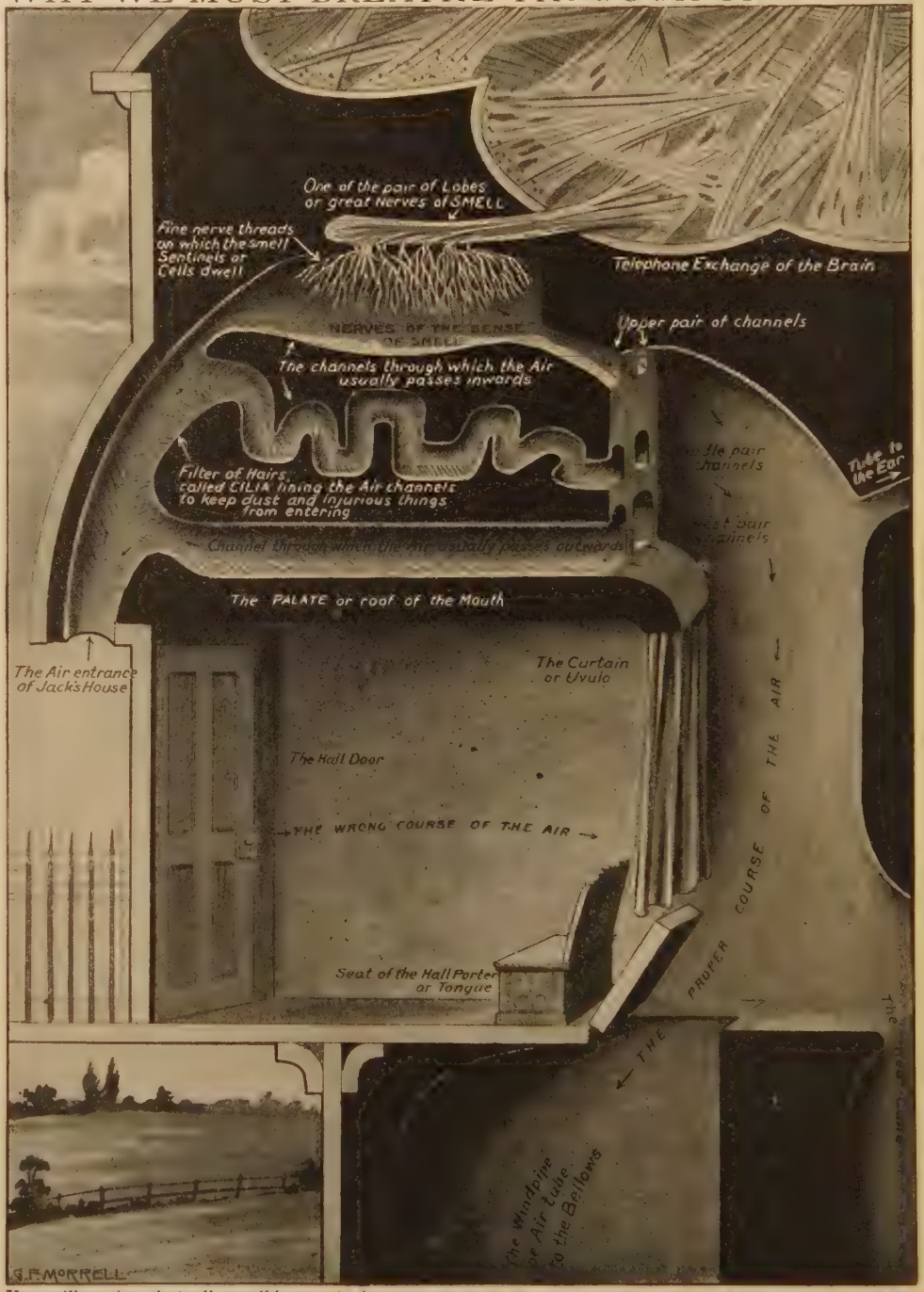
A POMPEII GARDEN THEN AND NOW

This shows life in one of the houses of Pompeii. The children are playing with their mother in a court similar to the one seen in the lower picture. These courts, inside the house and quite separate from the outside garden, were laid out with shrubs, flowers and fountains, and adorned with sculptures.

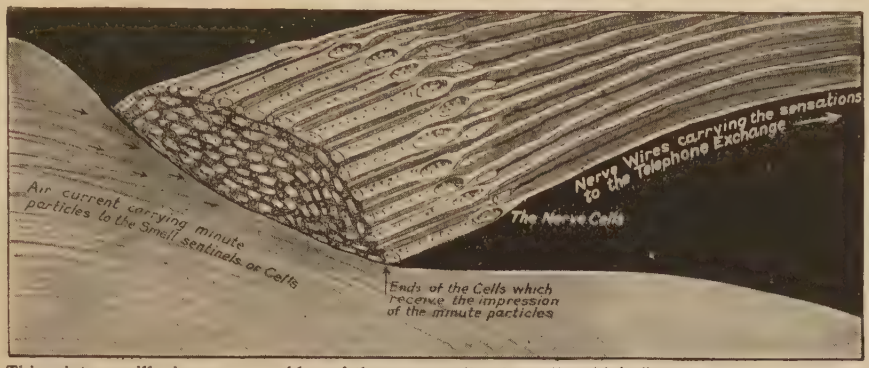


One of the wonders of the world is the way in which Pompeii has been preserved so that we can see much of it almost as it appeared two thousand years ago. Here is the open court of a house of the first century as it may be seen in this century. It is almost identical with its original appearance.

WHY WE MUST BREATHE THROUGH THE NOSE


One of the pair of Lobes or great Nerves of SMELL
Fine nerve threads on which the smell Sentinels or Cells dwell
Telephone Exchange of the Brain
NERVES OF THE SENSE OF SMELL
Upper pair of channels
The channels through which the Air usually passes inwards
Tube to the Ear
Filter of Hairs called CILIA lining the Air channels to keep dust and injurious things from entering
Channel through which the Air usually passes outwards
The PALATE or roof of the Mouth
The Air entrance of Jack's House
The Curtain or Uvula
The Hall Door
THE WRONG COURSE OF THE AIR
THE PROPER COURSE OF THE AIR
Seat of the Hall Porter or Tongue
THE
The Windpipe or Air Tube to the Bellows
G. F. MORRELL

You will notice that all sensible people breathe through the nose and not through the mouth, and this picture shows us why they do so. The little hairs which line the channels of the nose act as a filter, keeping back dust and other harmful things, and the value of this filter is lost if we breathe through the mouth, and consequently allow dust and germs to have free entrance into the lungs. This picture shows also the little cells which enable us to smell. When we smell a thing, small parts of it break away and touch the cells which live on the nerves of smell, and these cells are able to detect a particle of musk that weighs only a thirty-millionth of a grain, the sense of smell being more acute even than the eye aided by the microscope.


Air current carrying minute particles to the Smell Sentinels or Cells
Nerve Wires carrying the sensations to the Telephone Exchange
The Nerve Cells
Ends of the Cells which receive the impression of the minute particles

This picture will give us some idea of the nerve-cells of smell, which line the upper part of the nose. When we smell a rose or anything else a small particle of the rose or whatever it may be is drawn to these cells, and the sensation is carried by the nerves to the brain, which recognizes it.

JACK'S FRESH AIR SUPPLY

CONTINUED FROM 6110

IF the Architect of Jack's house had forgotten to provide for its proper ventilation the house could never have been built at all. The pity is that men are allowed to build any kind of houses without providing for the breath of life to flow through them; for Jack's house has to spend much of its time in houses built by men, and if they are not properly ventilated half the value of his own ventilation system is lost.

Jack's house needs air in order that his countless living servants may breathe. If we had said *burn* instead of *breathe*, that would have been an equaly true saying, for we may look upon Jack's house as a wonderful furnace, which requires a draught of air if it is to burn properly. The fuel which Jack eats, and which his chemists cook so skilfully, would be of no use to Jack unless he had a supply of air with which to burn it.

Burning, as we have already learned, means combining with oxygen which we get from the air, and this goes on everywhere all through Jack's house, and all through the houses of all living creatures, animals, or plants, whether they live in the air or at the bottom of the sea. Therefore every living thing requires and has a ventilation system which is suited to its body.

The centre of Jack's ventilation system is Jack's middle story, where are his bellows and, as we have seen, his pump is placed. But we must begin at the beginning, and we find that a special channel has been provided, just above the front door of Jack's house, for the air to enter.

The whole of the outside of Jack's body is more or less exposed to the air, but none ever enters through his skin, though a little does enter through the walls of ordinary houses. The living houses of some animals and plants are ventilated more or less through their walls. A plant breathes all over its surface, and a frog breathes partly by its skin. But Jack depends for his air supply entirely upon what enters his windpipe, the great air tube that runs down his neck into his chest, and if he cannot receive enough air through that tube he will die.

Jack's mouth, or hall, and his nose both lead to his windpipe, and air can reach it either through his hall door or through the two holes above it called his nostrils. If Jack runs hard, or swims hard, or if he has a cold, he is bound to open his hall door, and get a larger quantity of air that way,

but as a general rule air should not be admitted through the hall at all. Unless Jack has something to say, or something to swallow, his hall door should be kept closed. The Bible rightly says that God put the breath of man's life *in his nostrils,* not in his mouth; and, indeed, Jack may well remember this very good rule—*Shut your mouth and save your life.*

It is true that it feels easier to breathe through the mouth than through the nose. Why, then, should the mouth not be used, and why is it actually dangerous to allow the front door to be constantly open for ventilation?

Well, it is dangerous for many reasons, but one of them is easy to guess, for it is the very reason which often prevents us from opening our front doors. If we carelessly leave our doors open burglars may get in; and if Jack keeps his front door open burglars will get in there too—microbe burglars which may smash and destroy his house or burn it. There are several other reasons, but we cannot understand them until we study those openings, and what is behind them.

THE IMPORTANCE OF THINGS YOU MAY NEVER HAVE THOUGHT OF

If we look at our nostrils we shall usually notice a number of fine hairs. They act as if they were a kind of grating or sieve, and keep back tiny flies or specks of dirt which might otherwise enter with the draught of air. Now, from the two nostrils right onwards until the air reaches the great lungs, or bellows, themselves, it has to pass one thing after another which, though we cannot see it or understand it so easily, plays exactly the part of those hairs.

When we study the inside of the nose, we find that it has various channels or passages from the nostrils to the back of the throat. Instead of being straight these passages are most crooked and twisted, so that the air can never flow through the nose without striking against the inside of it at the turns, and having to go round corners. The inside of the nose is moist, and can readily be made moister whenever the air is rather dry or cold. The nerves that govern the blood-vessels inside the nose see to that. Thus, not only is the inside of the nose crooked and moist, but it is also warm. Nor is that all. The moisture produced inside the nose by the chemists which line its walls is distinctly poisonous to microbes. It is to some extent an antiseptic, like carbolic acid, or the acid which poisons microbes in the food when they reach Jack's great oven.

What all this means we can only learn by very carefully catching some air which has been breathed in through Jack's nose, just before it reaches his windpipe, and comparing it with the air in the room from which Jack breathed it.

THE FILTER THAT SURPRISES THE CLEVEREST BUILDERS

If we do this—as we can in a very wonderful way—we discover that Jack's nose is the filter of his ventilation system—a filter which does everything that can be done by the cleverest human builders, and much more besides. We can best prepare ourselves to understand and value this filter rightly by studying the construction of specimens of the best air-filters which have been made by men.

At a well-known hospital there are rooms for performing surgical operations. All the air which enters them does so through a special shaft, which it can only reach by passing through a filter. Now, this air-filter is made of a great screen of hanging cocoanut fibres, down which water is always dripping. As the air passes between these dripping fibres, it is filtered of dust and microbes to a large extent, and is also moistened. If the water were warmed, the air would also be warmed by the filter. Then a fan drives it down the shaft and into the rooms, and there the people who breathe it all filter it again, if they are wise and well, by breathing through their noses.

HOW THE AIR WE BREATHE IS CLEARED AND MOISTENED

The nose is the great air-filter of Jack's house, and it does just what the filter does in those beautiful rooms. But the nose is a better filter than anything man can make, and it does more for Jack's house than the cocoanut fibres and the dripping water can do.

For when we compare the air taken from the back of Jack's nose with the air outside, we find, first, that the inside air contains fewer microbes, and practically no dust, except of the very tiniest kind; and we find, next, that it is moistened, containing much more water-vapor than it did before; then we find, again, that it is warmed, for it has passed

over a large surface lined with plenty of warm blood.

How wondrously this filter of Jack's excels all the filters made by men we shall see. To begin with, not only has air to enter through this filter, but it also has to return by it.

THE AIR THAT TRAVELS ROUND CORNERS AND THROUGH CHANNELS

No human builder can make such an arrangement as this. He must always have an inlet shaft, where the filter is, and an outlet shaft. At the hospital the inlet shaft sends the air straight to the patient's place, and the outlet shaft is near where the lookers-on are, so that nothing can travel against the stream of air from them to hurt him. But in Jack's house the inlet shaft and the outlet shaft are one and the same, which is unlike any other system of ventilation in the world.

Now, the inlet has purposely been made difficult so that the air may be filtered and moistened and warmed. It has to flow round corners and through narrow places, but it would be an inconvenience if the air had to do this in coming out. Therefore the lowest of the three channels which we find inside the nose on each side is short and is almost straight; and we have discovered that practically all the air, on going in, travels through the middle and the upper pair of channels; but practically all, on coming out, travels by the lower pair of channels, though one pair of nostrils suffices for both purposes.

THINGS THAT WE NOTICE ON A VERY COLD DAY

This is really a beautiful discovery, for when first we study the shape of the inside of Jack's nose we cannot understand why the two upper pairs of channels should be so crooked and narrow, if the lower pair could let the air in. The fact is that, though the lower pair is open all the time, it and the others are just so placed that the in-draught is almost entirely through them, and the out-draught almost entirely through it. Further, if the upper and middle pair of channels are blocked, which too often happens, the lower pair still remains, and the air will do better to enter through them than through the mouth.

Indeed, this is an adaptable filter in every way. When the air is warm and moist, it is allowed to pass quickly and easily through the filter; but when it is cold and dry, and would do harm inside Jack's house, it is compelled to pass more slowly, and is exposed to more warmth and more moisture.

This beautiful arrangement is worked by those servants of Jack who sit in his upper story, and control, by nerves, the size of every blood-vessel in his body, as the train despatchers in their tower control the traffic over the railway tracks which run in and out of the railway station. When they get messages saying that the air is rather too dry and cold, they give orders to flood the lining of his nose with warm blood, by relaxing the walls of all the blood-vessels inside it.

THE FILTER THAT POISONS ITS ENEMIES

In order that the orders shall be effective, we find that the lining of Jack's nose is extremely loose on the bony walls, and so it can be stretched and filled with a great quantity of blood whenever it is feared that Jack is being supplied with air so cold and dry that it would injure the inside of his bellows.

We have seen that the inside of the filter produces something that poisons many microbes. When we blow our noses—which we should do more respectfully after learning what our noses are!—we clear the filter of a mixture of dirt, dust, and microbes; and if we consider how soon a used handkerchief becomes unpleasant, we realize what might happen to our lungs if we had no filter to breathe through.

But if we examine the lining of this filter with a microscope, we find still more wonders such as no other filter can show. Nearly the whole of its surface is covered with tiny living servants of Jack—cells which produce a steady flow of moisture to purify the air. These cells have a sort of hairs—called *cilia,* which is Latin for eyelashes—sticking out from them into the air-channel. These cilia form a sort of broom, which the cells that bear them keep brushing in one direction, so as to keep the filter clean. Their action never stops, even when we sleep, but goes on night and day.

These ciliated cells line the whole of Jack's ventilating shaft, from the nostrils down to the bellows, or lungs, themselves. When Jack has a "cold," and especially

when he has bronchitis, he loses the services of these excellent servants for a time, for multitudes of them are killed by the microbes that have succeeded in getting past the sentinels and have made Jack ill. Not until new ones take their place is Jack quite comfortable. One other interesting fact about these cells is that, like the white cells of the blood, which have wonderful powers of movement also, they are independent of Jack's officials in his upper story. No nerves order them about, and they move as they know they should, on their own account.

Very different are the cells which line one special part of Jack's nose, just where the incoming current is strongest. They are not merely connected with nerves, but are themselves nerve-cells.

THE SERVANTS WHICH GIVE JACK THE SMELL OF A ROSE

These servants of Jack are of a far higher kind than the cells which wave their cilia. They do not show, under the microscope, anything so wonderful as the "ciliary movement" of the other cells, but their power of feeling is really far higher and far more wonderful. When certain gases or particles of material come in with Jack's air-current and reach these sentinels, they are known and recognized as good or bad, or as not mattering one way or the other; and this smelling, as we call it, is done by the smell-sentinels in Jack's nose, together with a part of his brain, with a special kind of nerve-cells, which are experts at smelling, and can communicate with every other part of Jack's brain.

As a matter of fact, Jack's house is far from being as well supplied in this respect as the house of his dog. In human beings, the sense of smell has lost most of its importance, and the marvelous sentinels for seeing and hearing have taken the place of smell for most purposes—such as recognizing Jack's friends and enemies.

Nevertheless, these sentinels that line the upper part of the air-filter are not to be despised, even though they are stupid in comparison with the smell-sentinels of many animals.

SENTINELS THAT MAY SAVE JACK'S LIFE

These little servants can still recognize many bad things. For instance, if the gas has not been properly turned off at night, Jack's sentinels tell him that it is escaping, for they recognize some of it in the air-current which passes them. But for this warning Jack might go on breathing the gas until it overcame the unsleeping cells that govern his bellows, and he would stop breathing for ever and would wake up from sleep no more.

Also these sentinels give Jack much pleasure in the sweet scents of flowers in the country; and they are very useful in helping him to enjoy his food, for the scent of his food gets into his nose, and, indeed, a good deal of what he calls the taste of his food is not really taste at all, and should go, not to the credit of his hall-porter, but to that of the sentinels in his nose. The best proof of this is that Jack has a very dull taste of food when he has a cold, and the smell sentinels are drowned in fluid for a time, so that the smell of the food cannot reach them and his favorite dishes seem to him dull and unpalatable.

THE LITTLE TUBE OF AIR THAT HELPS US TO HEAR SOUNDS

Lastly, from each side of this filter there runs a tube which carries a little air to the inside of Jack's ear, so that there is air inside as well as outside Jack's ear-drums, and sounds can move them freely. This tube has a long difficult name—the Eustachian tube. The name was given to it in honor of a famous Italian named Eustachio who lived in the eighteenth century. This great man found out what a faithful servant this tube is in Jack's house.

Such is Jack's filter. If it is not in good working order—as when part of the lining is overgrown and he has *adenoids*—he becomes a "mouth-breather," and suffers in many ways. No one can afford not to use this living filter, which stands at the beginning of the ventilation system, and without which Jack's house can never be as clean and habitable and durable as it should be.

If Jack is to gain the full benefit of this wonderful filter, unless when he is talking or shouting, he will always breathe with his mouth shut, whether he wakes or sleeps. If he does this, almost all the air that enters his house will be cleansed and purified, and the tiny enemies that would take away his health will be stopped at the outer gates by the trusty sentinels who stand on guard.

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A FAMOUS BOOK ABOUT A FAMOUS VOYAGE

RICHARD HENRY DANA was a member of a distinguished family of Boston, and, as he tells us, made the voyage around the Horn for his health while a student at Harvard. His book tells of the life of a common sailor, of the strange Spanish land of California, of the manners and customs of the people, and of his thoughts and feelings on the voyage. Sailing ships had almost disappeared when the Great War began, but it has called some of them back. This book is one of the best descriptions we have of life on one of these vessels in the first half of the last century. After Mr. Dana's voyage he returned to his studies, was graduated at Harvard, and later became a famous lawyer. He wrote a book for sailors telling them what their rights were, and to the end of his life was interested in the sea, and in sailors. This book is read as much to-day as when it was first published.

TWO YEARS BEFORE THE MAST

CONTINUED FROM 5955

RICHARD HENRY DANA, when an undergraduate at Cambridge, determined to take a long sea voyage in order to cure a weakness of the eyes which threatened to spoil his career. Accordingly he shipped on the brig Pilgrim, bound from Boston round Cape Horn to the western coast of North America, a long and tedious voyage. The first day at sea the captain of the ship addressed the crew as follows: "Now, my men, we have begun a long voyage. All you've got to do is to obey your orders and do your duty like men,—then you'll fare well enough;—if you don't, you'll fare bad enough, I can tell you. That's all I've got to say. So below, the larboard watch."

Dana was utterly new to the sea, and felt very keenly all the discomforts of a sailor's life. At first he lived in the steerage, which was filled with coils of rigging, spare sails and old junk. There were no berths built into the sides, no nails for their clothes, no light allowed to find anything with, and the rolling of the ship pitched everything about in great confusion. In the darkness and noise the new sailor had the added misery of seasickness. While in this state he was first ordered aloft to reef topsails, and the wonder is that he did not pitch headlong upon the deck. So matters continued for two or three days till the weather bettered, and Dana was able to take good solid rations of salt beef and biscuit. From that time he was a new being. By degrees the strange names of things on board became familiar to him, and he entered upon the regular duties of sea-life.

He soon realized what a busy life this was which he had adopted. The discipline of the ship required every man to be constantly at work when he was on deck, except at night and on Sundays. When not actually engaged in sailing the ship, the vessel was overhauled and repaired by the men. Her running gear had to be kept, at all times, ready for any emergencies. When it was not the sails, then it was the rigging which needed examining. All the yarn used on board a ship for the numberless ropes or yards that showed signs of wear had to be made on board, and the mending of this "chafing-gear," as it was called, gave constant employment during the entire voyage. Added to this was all the tarring, greasing, oiling, varnishing, painting, scraping and scrubbing required in the course of a long voyage. On wet days, instead

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of allowing the men to stay in sheltered places at work, they were separated in different parts of the ship and kept busy picking oakum. All these things young Dana was to find out during the long months of the journey, when the monotony of the days was broken only rarely by the sight of a sail.

Through the late summer and autumn the ship ran on with few adventures upon her southerly course towards Cape Horn. Once they were chased by pirates for a day and a night, but escaped by spreading more sail, and putting out all lights on board at nightfall. In the latitude of the La Plata the first of the gales struck the brig, and early in November they sighted the Falkland Islands, as they ran between them and the mainland of Patagonia. They were now in the region of Cape Horn and saw the Magellan Clouds and the Southern Cross, the latter the brightest stars in the heavens. All were prepared for the dreaded Cape weather and it did not delay its onslaught upon them. A fine specimen of it appeared in a great cloud of dark slate-color which drove upon them from the southwest; in an instant the sea was lashed into a fury and it became almost as dark as at night. The sailors did their best to take in sail, but a cold sleet and driving hail almost froze them to the rigging, while the sails were stiff and wet, and the ropes and rigging covered with sleet and snow. The little brig plunged madly into this tremendous sea, and wave upon wave rushed in through the portholes and broke over the bows. An order was given to furl the jib, the sail forward of the foremast, and two of the men had to go out on the bowsprit. An old Swede (the best sailor on board) sprang forward and Dana followed him. As the vessel plunged downward the men were submerged in the sea up to their chins, and for some time could do nothing but hold on. No help came to them from the decks, for the fury of the wind and the breaking of the seas against the bows prevented any shout from being heard. At last they succeeded in furling the jib, after a fashion, and came in to find all snug and the watch gone below, for they were soaked through and very cold.

Day after day passed with but little change in the weather. The men's clothes were all wet through and they had no means of drying them, and could only change from wet to wetter. They could not read or work below, for the hatches were closed and everything black and dirty. Their only relief was to come below when the watch was out, wring out their wet clothes, hang them up and turn in and sleep until the watch was called again. At night and morning they were allowed a tin pot full of hot tea sweetened with molasses, which, bad as it was, was the only warm food they had, and which with their sea biscuit and cold salt beef comforted them somewhat. One of their shipmates then fell overboard heavily dressed with heavy coils of rope around his neck. He could not swim and probably sank immediately. This depressed the sailors seriously, for the man had been a fine seaman and a good shipmate, and one out of their little company was seriously missed. As was the custom, the captain immediately held an auction of his things, and in this way the trouble and risk of keeping them through the voyage were avoided, and they were generally sold for more than they were worth ashore.

At the end of November they sighted land and made out the island of Juan Fernandez rising like a deep blue cloud out of the sea. The captain and some of the crew went ashore to get fresh water, and they found that the island was used by the Chilian government as a convict settlement, with a governor, a priest, half a dozen taskmasters, and a body of soldiers to keep the prisoners in order.

They saw neither land nor sail from the time of leaving Juan Fernandez until their arrival in California. Dana's lot was lightened by being allowed to shift his berth from the steerage into the forecastle and bunk and mess with the crew forward. The weather in the Pacific was fair and the climate never extremely hot or cold. At last, early in January, they came to anchor in the spacious bay of Santa Barbara after a voyage of one hundred and fifty days from Boston.

The brig expected to trade upon the coast of Upper California, but instead of going first to Monterey, the seat of government and only custom house, where the cargo had to be entered, the captain had orders to put in at Santa Barbara and wait for the agent, who lived there and transacted all the business for the firm. Accordingly as soon as they had

picked him up they set off for Monterey. The weather had changed again and for four days of rainy, stormy weather they beat up the coast against a violent head wind. After some delay they entered the Bay of Monterey and found good anchorage where they could lie safe from the "southeasters," which were the chief difficulty on this coast.

Then the trading began. A room was fitted up in the steerage, and the men, women and children were rowed out to the vessel to look at the cargo and make their purchases. The Pilgrim's cargo consisted of everything under the sun—from Chinese fireworks to English cartwheels—and everything was sold very dearly, partly because of the heavy duties laid upon imports, and partly because of the great expense of the long voyage. The ship's crew was busy from daylight until dark in the boats, carrying goods and passengers, for everybody made a holiday to come on board and see the strange vessel even if they only bought a packet of pins. Thus engaged the men gained considerable knowledge of the character, dress and language of the people, and Dana himself borrowed a grammar and dictionary from the cabin and soon got the name of a linguist among the crew.

As soon as the trade slackened at Monterey the brig left for Santa Barbara, and there the crew had their first glimpse of what taking up their own cargo would mean. They had come for hides, and had supposed when they left Boston that it was on a voyage of eighteen months or two years at most. It was found that the hides were scarce and yearly becoming scarcer, and it would take a year at least to collect their own cargo; in addition, they learned for the first time that they had also to collect a cargo for a large ship belonging to the same firm which was soon to come up the coast. The gloomy prospect of two or three years at the end of the earth, on a coast almost solitary, and in a country where there was no law, hung over the ship and the men became miserable and indifferent. Trouble was brewing and nothing went right. The captain quarreled with the cook, and disputed with the mate, and finally tied two men up to the shrouds and cruelly flogged them for fancied insolence. After this the comfort of the voyage was at an end.

The book is one of the best descriptions we have of life in California under Mexican rule, for the state did not become a part of the United States until fifteen years after Dana's voyage. Scattered through it there are many incidents of persons and places which enable us to understand the country of those days, when there were few white men in the whole region. Those of unmixed Spanish blood called themselves Castilians, and were very proud of the fact. Most of them, however, were part Indian. The Indians themselves were little more than slaves. Little farming was done, but there were great herds of cattle and horses. A good horse could be bought for ten dollars or less, and the cattle were chiefly valued for their hides and tallow. Thousands were killed for these alone, and of course fresh meat was sold for almost nothing.

For some time the brig cruised up and down the coast, collecting hides till she had as many as her hold would carry, and she then sailed to San Diego, where the firm had a hide-house built to hold forty thousand hides. There was not a man on board who did not go a dozen times into the house, and look around and make a calculation of the time it would require to fill it. As the hides came rough and uneven from the vessels they were piled outside the house and then carried through a regular course of pickling, drying and cleaning, in order that they might keep during a warm voyage. For this purpose an officer and some of the crew were left ashore and Dana was among the shore gang. He and the others made their home in one corner of the large hide-house, which was boarded off, and in which there were berths, a table, a small locker for pots and spoons, and a hole cut to let in the light. The officer had a similar small room where he lived in state.

His companions on the beach, other than the ship's crew, were, for the most part, Sandwich Islanders, or, as they called themselves, "Kanakas." Dana liked these men for their kind-heartedness and intelligence and soon learned to speak their language, though they had no books and very little education. Whatever one of these men had, they shared with the others,—money, food, clothes, even to the last pipe of tobacco to put in their pipes. Then there was a

large number of dogs, who were useful in guarding the beach at night. These same dogs, and a few chickens, made up the entire population of the beach.

The men turned out every morning at the first signs of daylight, and allowing a short time for breakfast, got through their labor between one and two o'clock, for there was a regular amount of work to do each day, and when that was done the time was their own. Just before sundown, the dry hides were beaten and put in the house and the others in their various stages of preparation covered over. The evenings were their own and were usually spent at one another's homes. The work was hard, disagreeable and tiring, but they became hardened to it, and the feeling of freedom made up for much. Through the season other vessels came to the beach to discharge or pick up hides, and the crews came ashore every evening and made a varied gathering from almost every country under the sun. The Pilgrim, too, from time to time brought fresh cargoes of hides, and the news that the company's large ship, the Alert, had arrived, and that their own captain had taken charge of her and gone up to Monterey with her.

Dana was becoming very anxious as to his own future. If he had to stay with the Pilgrim for four years, his chances of another career would be gone forever, for he would be a sailor in tastes and nautical knowledge, and his companions at college would have gone on and left him far behind. He became then eager, as indeed were all the crew, though for different reasons, to get home. But if the worst came to the worst and he was forced to stay at sea the best he could do was to qualify himself for an officer, and for that purpose must learn practical seamanship on board ship, and must leave his hide-curing and join in the cruising upon the coasts. When the Alert arrived he obtained permission from the captain to exchange with one of the crew and accordingly entered upon a new life at sea once more.

The new ship was better in many respects than the Pilgrim, in order and cleanliness, in discipline and good feeling. Dana had mended and generally overhauled his wardrobe during his time ashore and in spare time now had nothing to do but read when he could find a rare book among the chests of the crew. But this was too good to last and rough weather came on, when all hands were ordered on deck to make or trim sail, and the men's clothes got wet through again as they had done off Cape Horn, and again there was no place to dry them. So the winter through there was little difference in the seasons, and the months were given up to collecting the tale of hides that the company expected and taking them down to the hide-house to be prepared for the voyage.

At last in March came the first assurance that the voyage was really drawing to a close. The captain gave orders for the ship to go down to San Diego, to discharge everything from the ship, clean her out, take in hides, wood, water, etc., and set sail for Boston. There followed six or eight weeks of the hardest work they had yet seen, from the gray of the morning till starlight, with only just time to swallow their meals. The hides were stowed in the hold by hand, and then " steeved " or forced down, by which a hundred hides are pressed into a place where one could not be forced by hand. The crew was a cheery one, and filled with the hope of home, and songs rose and fell in tune with the work. All this time they lived upon nothing but fresh beef,—fried beefsteaks three times a day,—morning, noon, and night. A whole bullock lasted but four days, but all were in perfect health and needed the heavy food to keep up with the heavy work and exposure.

The Pilgrim was not returning to Boston, but Dana knew that the owners through the influence of his friends had arranged for him to go back in the Alert and his heart was easy. One day he received a summons into the cabin, and going aft found his own captain and the agent there. Captain T—— turned to him.

" Dana, do you want to go home in the ship? " he asked.

" Certainly, sir," Dana replied. " I expect to go home in the ship."

" Well," said he, " you must get some one to go in your place on board the Pilgrim." Such a blow was so unexpected that for a moment Dana was completely taken aback. As soon as his wits came to him he told the captain plainly that he had a letter in his chest informing him that the owners had written the captain to send him home in the

Alert. His firmness enraged the captain, and had he been friendless and poor, there is no doubt that he would have been condemned to spend two more years in California.

With over forty thousand hides, thirty thousand horns, and barrels of otter and beaver skins, the Alert pulled up anchor and set sail. The ship was only half manned, and loaded so deep that every heavy sea washed her fore and aft, the forecastle leaked, and the journey round the Horn had to be made in the depth of winter, yet the men made the best of it, though drenching rain kept them in a state of perpetual discomfort, and scurvy made its ravages upon the crew. All fresh food soon gave out and things were beginning to look bad when they hailed a brig outward bound from New York which gave them potatoes and onions and thus arrested the progress of the dread disease. Scurvy is hardly known these days, but then it was common. It is caused by a lack of fresh fruits or vegetables. Then salt provisions were the usual food, and prisons and ships often had many cases. Now fresh meat can be carried in the ice chest, and more attention is paid to carrying vegetables.

As the ship neared the home port, great preparations went ahead to make her trim. The rigging was set up and tarred, the masts stayed, the ship scraped and painted inside and out. After a voyage of one hundred and thirty-five days they came up the harbor and by night lay snug, with all sails furled, safe in Boston Harbor, the long, perilous voyage ended.

In those days the life of the common sailor was very hard. The captains had absolute power and many were brutal and cruel. The members of the crew could do nothing in self-defence while on ship, and except in a case of unprovoked murder, their complaints on shore had little effect. In the story we find many instances of the harshness which sailors were compelled to endure. Sick men were neglected, or set to work when too weak to stand. Everything in the way of clothing the sailor bought from the ship was charged to him at a very high price, and he was lucky if he had any of his wages left when the ship reached the home port after a long voyage. He was compelled to get another ship at once, where he was likely to be just as badly off. It is not surprising that the common sailor was careless and reckless.

This is a picture of State Street, Boston, at the time that Dana made his famous voyage. The old State House still stands, but the other buildings are different. Costumes have changed as well as everything else.

A DASH AFTER BIG GAME IN THE JUNGLE

THE HUNTSMAN, HAVING APPROACHED NEAR, MAKES A DASH UPON THE ANIMALS

Giraffes, zebras, elands, and other animals of this kind, always take to flight at the least sound. The hunter who wants to catch them alive has to be very cautious. He approaches them carefully, making no noise, and, keeping himself well out of sight till he is near, rushes out and overtakes the younger animals, that cannot run so fast as the older ones. It is the young animals that are wanted, as they easily adapt themselves to a life of captivity, whereas the older ones remember and pine for the freedom of the wilds, and quickly die.

YOUNG WILD ELEPHANTS BEING LED CAPTIVE BY TRAINED ANIMALS

THE HUNTERS OF THE WILD

HOW THE ANIMALS CAME TO THE ZOO

CONTINUED FROM 6068

WHEN we spend a day at the Zoological Park, in New York, and see the enormous number of animals, birds, and reptiles there, we cannot but feel that we have around us a little model of the whole animal world. Of course, there are still many species of animals and birds not represented, for there are many which it is impossible to keep alive in captivity. However, we have before us a collection drawn from all quarters of the world.

They have come from the vast spaces of Australia, from the jungle of India, from the sub-tropical forests of South America, from the rolling prairies of North America, from the burning plains of Africa, from the frozen North, from the little islands where it is always summer; they are taken from the wild highlands of Tibet, from the steep sides of the Alps, from caves and burrows, from the air, and from the sea.

Many of the animals, after their capture, have made long journeys on foot through the desert, have been carried in ships across the sea, and have been treated on their way with as much care and anxiety as if they were royal princes. There are many other zoos like the one in New York, not all so well stocked, but still good. There are several good collections in the United States and more than forty in Europe, to say nothing of private collections and a host of menageries.

To get together great families of animals such as these needs a world-wide system of hunting. We can see that this must be so when we look at the elephant, the rhinoceros, and the hippopotamus, with their huge bulk and terrible strength; the lions and tigers and leopards, with their savage natures, their strength, and speed; the bears, with their fierce, slow strength; the monkeys, with their agility and cleverness; the snakes, with their deadly powers.

Probably his own misfortunes first taught man how to capture animals more powerful than himself. The men of old times saw mammoths and other great creatures made prisoners by the marshes into which they wandered; and, desiring food, these men gathered their forces and attacked the imprisoned animals where they were. Then, having practised this for some time, they easily learned how to catch these animals by making

traps for them, simply by digging a pitfall into which the creatures fell. To this day we employ this method for the capture of many of the animals which come to our zoos, particularly for the rhinoceros and the hippopotamus. Men often shoot the parent animals, and capture the young ones as best they can. But the methodical hunter lays his plans more deliberately.

How the Hippopotamus and Rhinoceros are Trapped

As we already know, the mother hippopotamus, when she takes her young one out from home to drink at a pool, sends him on ahead, while she brings up the rear, carefully looking out for danger. The hunter seeks the well-beaten paths in the reeds or grass or bushes leading to and from the water which the hippopotamuses take. When he has found one he digs a pit in it and covers it over with boughs. The baby hippopotamus and the mother trot along, and suddenly, as the youngster puts his foot down, the earth seems to open under him, and he disappears from sight.

Now, if it were an open enemy which had attacked her little one, the mother would charge him with all her strength, but this disappearance is so mysterious that she turns round and bolts for home. The hunters come up, slip a noose over the head and front feet of the little one, then raise him from his prison, tie all four legs, and bind him up so that he can be carried away.

A Tame Rhinoceros and Its Friends

Much of the same plan is adopted for the snaring of the young rhinoceros, but here the difficulties are less, for the young rhinoceros is a better-tempered fellow than the other, and can soon be taught to follow his captors like a dog. A rhinoceros captured in Africa at once made friends with a tame goat, a vulture, a stork, and a baboon, and all the way down to the coast these friends were not to be separated. Especially was the young animal friendly with the goat, for it was upon the milk of this creature that it was first fed. The rhinoceros was taken to Germany, but its captors had to send the goat with it, and when it was last photographed it had grown to be quite a big rhinoceros, while the goat was the proud mother of two kids, which also lived with the rhinoceros.

Most of the lions which we see in zoos and menageries were captured when young, though many are born in captivity. They are not taken without a struggle, unless they are very young, for when only six weeks or two months old they make a brave fight for liberty. Therefore, the hunters generally throw a net or cloth over them.

If they are very young, they have to be reared by the kind attention of some other animal. For this purpose goats and kind-tempered dogs are used. Naturally, these animals are a little alarmed at first at the rough and fierce manners of their foster-children, but there is a marvelous power of friendship between a mother animal and baby animals, even if the baby animals are of an entirely different order.

The same practice applies to the capture of tigers as to that of lions. When full-grown lions or tigers have to be taken, it is a much more serious business. Many hunters make the old pitfall; then, when the animal has tumbled in, they lasso its feet and head, and throw a net over it. But often the animal injures itself in its fall, and dies.

A Giant Mouse-Trap Set to Catch a Beast of Prey

The safer way, therefore, is to set a sort of gigantic mouse-trap. The door leading into the cage is held up by a spring. When the lion or tiger enters, and takes the bait, the spring is released and the door shuts down with a bang. Sometimes a lion, with more cunning than its fellows, suspects one of these traps, and, instead of walking into it, lies down and hides outside in waiting for the men who set the trap. One lion which was trapped got one of its paws shut in by the door, and when the hunters came up to secure the animal, it made a tremendous effort, burst open the trap, and, springing out, killed two of its would-be captors.

The same sort of trap serves for the leopard, the hyena, and the wolf, though the American master of craft, the wolverine, has been known to travel forty miles, stealing the bait from trap after trap set to catch it, and never once entering one of them.

The Swift Cheetah Famous Among Indian Hunters

The cheetah is one of the animals most commonly trapped in India, where

WATCHING FOR THE WILD ELEPHANTS

The capture of wild elephants alive is a very exciting business, and months are occupied in preparing for the hunt. A great enclosure is built, and hundreds of natives, armed with rifles, drums, and firebrands, surround the haunts of the elephants, and, by frightening them with noise and fire, drive them into the enclosure, of which we see a corner in this picture. They are afterwards secured and tamed.

The driving of the wild elephants into the enclosure is watched by Europeans from a platform built high up in a tree. Any number up to a hundred elephants may be caught at one time in this way. When they have been in the enclosure for some time, tame elephants, which have been trained for the purpose, are driven in, and these occupy the attention of the captives while their legs are being tied to tree-trunks by natives.

the native princes keep packs of these animals for hunting. An interesting thing is that cheetahs, to be good hunters, must be caught wild; those which have been born in captivity are worthless for the work. The natives have a peculiar way of catching these animals. Grown-up cheetahs are wanted, and the grown-up cheetah is the fastest runner in the world. Probably the fleetest thing on legs, next to itself, is the swiftest of antelopes. Should a cheetah see an antelope two hundred yards away, it runs with such amazing speed that it can catch the antelope before it has run four hundred yards. Luckily for the antelopes, the cheetah can run only for a short distance.

When wild, the cheetah, after killing an animal, retires to some secluded spot to sleep off the effects of its meal. When it is hungry, it goes to a place where many cheetahs meet, generally in the neighborhood of a tree. The natives tie running nooses to this tree, and the cheetah gets its head fast in one of these and so is easily captured.

THE GORILLA IN A TREE
No man has ever caught a grown-up gorilla alive.

CATCHING THE GIANT GIRAFFE

When men set out to catch giraffes or deer, elands, and other animals from which little or no danger to themselves is to be feared, they approach very cautiously and quietly as near as possible to a herd, then suddenly dash out on their horses into the open in pursuit. Away go giraffes, zebras, and gnus, and gazelles, and antelopes in company. There are young ones with them, and it is these that the men capture. They really do not want the old ones, for they would be likely to die. Many animals do die in this way, from a mixture of fright and sorrow. The young of wild animals, however, are like children; though they may feel their griefs acutely for the time being, they soon forget the bitterness of their sorrow. The young ones are introduced to cows or motherly goats, which, after a few protests, give the little things all the milk they need, and so fortify them for the long march which they will have to make night by night, when the hot sun is out of sight, down to some seaport.

THE FIERCE GORILLA THAT DIES WHEN IT LOSES ITS FREEDOM

Men have caught species of nearly all the known apes and monkeys. Yes, even young gorillas and chimpanzees and gibbons have been taken. Hunters have never yet managed to take an adult gorilla alive, and probably never will, so fearful is its strength, so unyielding its ferocity. If they did, it would probably die by starving itself. Even the little ones cannot be kept alive, so homesick are they, and so delicate through the change of climate and of food. No gorilla has had a longer life in captivity than the famous one that lived in the Bronx Zoo for almost a year.

Hunters find it easy to catch monkeys and baboons. There are all sorts of ways of catching monkeys, for they are great thieves, and will go wherever food is to be got. In India the monkey is sacred, because an old tradition tells that a monkey god helped to do a great work for the people of the country.

A WILD ELEPHANT BEING TIED TO A TREE

Tame elephants are very skilful in assisting hunters to tie captured animals, and they seem to enjoy the business thoroughly. They entice the captives near suitable trees, and all through show almost human intelligence. Here two tame elephants are leading a young wild one to a tree, while a man is about to put a rope round the captive's leg. Tame elephants sometimes use their trunks to protect the hunters.

One after another the legs of a captured elephant are fastened to stout trees. The creature grows furious, but, after wasting his energy in pulling and trumpeting, becomes exhausted, and gives in. Then he is treated to luscious food, and gradually becomes tamer, until at last he can be untied. Here the elephant seen in the upper picture has given up the struggle, and lain down. When a wild elephant will not lift up a leg so that he can be tied, the hunters tickle his foot with a leaf, and he at once raises it and the rope is slipped under it.

Therefore, recognizing that they are secure from injury, they become very bold, and are a real nuisance. Out in the wilds they have great battles, and fight in the natives' gardens, doing grievous damage to the poor people's crops. One wily native decided to punish the ring-leader of a swarm of monkeys which had injured him in this way.

He made a hole in the ground, and in it he placed a nice ripe banana. He concealed round the mouth of the hole the noose of a rope, which he hid in the sand. This rope ran through an iron ring which was attached to the trunk of a tree near by; and the end of the rope the native himself held as he hid and waited. Up came the monkeys, the bold old male leader coming out into the open, while all his wives and children remained for the time being hiding in the bushes. Ambling up he caught sight of the banana lying in the hole and grabbed at it. The native pulled the rope, and the noose closed round the arm of the monkey.

A good pull at the rope drew the monkey up to the tree where the iron ring was fastened. Then the native came out, and, walking round and round the tree, wound the rope round the monkey till he was securely fastened. The man then got a pot of soap and a brush, lathered the monkey, and shaved him. Then he released the monkey, who returned to his companions. They gazed upon him with amazement and disgust, fell on him and beat him, and drove him away. Their band broke up, and the man and his crops were left in peace.

A WILY NATIVE TRAP FOR FIERCE BABOONS

Baboon-trapping is exciting. It is easy to catch the animals, but the danger comes when they have to be handled, for their bite is terrible, and their strength is almost beyond belief. The hunters block up all the drinking-places but one. Near this they construct a trap like a hut, with a spring door. This is left open for some time, and grain is scattered in and about the trap, till the animals look upon it as a sort of refreshment-room. Then one day, when many are inside, a hunter pulls the trigger, the door shuts down, and the baboons are prisoners.

But no man dares go in to secure them. So pronged sticks are thrust through the sides of the trap, and by this means the baboons are fixed, one by one, without hurt, to the walls of the hut, while their legs are secured. After they are thus tied, they are muzzled, and wrapped from head to foot in canvas, till they look like mummies. Very soon this treatment tames them, and they are placed in cages.

ELEPHANT-CATCHING: ITS EXCITEMENT AND DANGERS

Elephant-catching is exciting and interesting. These great animals are so much used for work in India that it is necessary to make frequent hunts for their capture, because elephants are rarely born in captivity. There are four ways in which these hunts are carried out. There is the hidden pitfall, into which the poor creatures tumble, often injuring themselves badly. Another way is for brave natives to steal up to a wild elephant as the herd is running away, and to cast a noose round its leg. Then the rope is twisted round the trunk of a tree, so securing the runaway. A third plan is to pursue a herd, the hunter riding on an elephant, and casting a noose over any one that he can catch. This, however, is not satisfactory, for by this means only the slowest, and therefore not the best, animals are caught, and there is great risk of injury, not only to the fleeing elephant, but to that which is pursuing, as well as to its rider. The best-known way of capturing elephants is to surround a herd and take them all.

When food is scarce, a large herd of elephants will break up into several small groups, the several parties keeping a few miles apart from each other and coming together again when rains have made food plentiful. The hunters go out three months in advance of the time fixed for the actual attempt at capture.

The party of men numbers two or three hundred. Their work is to find out the groups of elephants, and gradually to drive them all together. The men make, as it were, a ring round that part of the country over which the scattered herds are distributed. All work toward one centre and to this the elephants are gradually driven. Generally the wild elephant will seek safety in flight rather than attack a man.

While the hunters are slowly working the elephants up to a certain point, other men are busy preparing a great enclosure. A space of ground is fenced round with

a giant stockade, each piece of timber being the trunk of a strong tree. There is only one way into this—a narrow, funnel-shaped opening, which is closed once the herd has entered. At last, on the day fixed, the whole herd—males, females, and little ones—is driven toward this entrance. So far the task of the hunters has only been to keep the elephants together day and night.

By day they fire their guns to keep them within certain bounds; at night they light large fires to keep them from breaking out of the ring. Now that the animals are at last in the fatal enclosure, the time has come for the *mahouts*, as the elephant-keepers are called, to show their skill. But no matter how skilful they are, they could do very little were it not for the help given by tame elephants, as will be seen in the following account of a capture.

A HERD OF CAPTURED WILD ELEPHANTS

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A herd of wild elephants had been driven into a safe enclosure, and two tame elephants, bearing their riders, entered. One had been doing good service in captivity for over a hundred years. The other elephant, named Siribeddi, was about fifty years of age. She entered the enclosure with a noiseless step, carrying two men on her back, and sauntered along with a simple air toward where the trapped elephants were. Every now and then she stopped to pluck a tuft of grass or a few leaves, as though she were engaged in the most ordinary work. The older elephant jogged innocently along behind. As the two tame elephants drew near, the wild ones advanced to meet them, and their leader put his trunk in a friendly way over the head of Siribeddi.

Siribeddi crept after him, and gave the man with the noose a chance to slip down and put it over the other elephant's foot. He saw the danger, and shook off the rope; then he turned to make a furious attack upon the man, who would have been killed had not Siribeddi driven back the attacking elephant.

The herd again formed a circle, and the two tame elephants pushed their way into the middle of the group, one on each side of the largest male, so that the three stood abreast. The male made no resistance, but showed his uneasiness by shifting from foot to foot. The man with the noose now crept up, and, waiting until the elephant lifted a hind foot, drew the rope tightly round it. The other end of the rope was fastened to Siribeddi's collar. When the noose had been fixed, Siribeddi instantly drew back, dragging the elephant with her. The old elephant followed.

The wild elephant had to be drawn backwards for fully thirty yards, struggling and plunging all the way. But Siribeddi knew her business. She walked round and round a tree, winding the rope round it, all the time holding it tight. With all her strength she could not draw the elephant close up to the tree, so the old elephant now approached, and facing him, head to head and shoulder to shoulder, forced him backwards. At every step Siribeddi drew in the slackened rope, and finally brought the wild elephant to the very foot of the tree. Then the man tied the second hind leg to the tree, after which the tame elephants placed themselves on each side of him, so the man could creep down and draw a rope round his fore feet, and he was a prisoner.

The largest and strongest female elephant is generally the leader of the herd, and there is often a strong family resemblance between members of the same herd. In India even the elephants are known as "high-caste" or "low-caste" according to their distinctive marks.

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A GREAT PIONEER

Daniel Boone is here represented on a hunting expedition in his old age. Up to the end of his long life he made long hunting trips, sometimes with only one companion, and it is said that on one of these trips he traveled across the continent, and that he saw the wonders of the region that is now Yellowstone Park.

A Pioneer's Log Cabin in the Backwoods.

TWO AMERICAN PIONEERS

CONTINUED FROM 6177

THE pioneers of an army are the men who, armed with spades and axes, go before the main body to prepare a camp, dig trenches, or bridge rivers. So we can easily see how the word came to be used as a name for men who strike out on a new path, making a way for others to follow. When we speak of "The Pioneers" in the history of North America, we mean particularly those men who left the older settlements and struck out into the forest, across rivers and mountains, plains and deserts, to make new homes in the wilderness. They were brave, hardy men, filled with great courage. Sometimes they left the older settlements to make room for other members of their families. Sometimes on a hunting expedition, they wandered into a more than usually fertile or beautiful spot, of which they made haste to tell their friends. A few of them, like Cooper's "Pathfinder," grew to love the quiet and loneliness of the woods. The sound of the wind in the trees and the song of the river were more to them than the voices of men, and they fled at the approach of civilization. Some of them were men to whom any kind of settled life was hateful. Others set out in search of gold, like the miners of California, or, nearer our own time, of Alaska and the northern part of British Columbia. Where they went others followed, and we owe it to the pioneers that the vast prairies of the West, over which the buffalo roamed, have become a granary for millions, and the busy hum of cities is heard where once the howl of the wolf broke the silence.

THE BEST KNOWN OF AMERICAN PIONEERS

Many of the picturesque band of early pioneers are to us nameless. Others had names which will be handed down through history, and perhaps the best known of all, not so much for what he did, as for what he was, is Daniel Boone.

Throughout Daniel Boone's long life, the frontier was his home, and from his early childhood to his old age his days were full of adventure. It is strange to us now to think of the Schuylkill Valley as being on the frontier, but when he was born there, in 1734, not fifty years before the Declaration of Independence, it was just on the edge of civilization. He was born in a log cabin, and until late in his life he did not know what it was to live in a less primitive dwelling.

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It is always interesting to know something about the family of a noted man. We like to ask about his people, where they came from and what they were like, and fortunately in the case of Daniel Boone we can answer all these questions. Some years before the time that our story begins, a Devonshire weaver came to settle in the Quaker colony of Pennsylvania, bringing with him his wife and a large family of boys and girls, whose influence for good in the country has been great and far-reaching. Squire Boone, one of these boys, married Sarah Morgan, a Welsh Quakeress, and Daniel Boone was one of their sons. Both his father and mother were brave and good, and taught their children the self-dependence, self-control, large patience and loyalty for which Daniel was noted.

LIFE ON THE FRONTIER

There were few schools in the country in those days, and none within his reach, and it was not until he was fourteen that he got a chance to learn to read and write. Then his brother's marriage gave the boy a sister-in-law who gladly taught him all she knew,—reading, writing, and a little arithmetic. But though he was able to gain little knowledge from books, he learned many things from nature. He knew well the trees and plants in the forest, and was familiar with the haunts and habits of the wild things that made the woods their home.

About five or six miles away from his clearing, Daniel's father owned some good pasture land, to which the cows were sent to graze each summer. There the boy's mother took him every year from the time that he was ten years old, and there they stayed until the cold weather forced them to go home again. His task was not an easy one. He had to keep the cattle from straying away into the deep forest through the day, and in the evening drive them back to the log enclosure round the cabin, where he helped his mother to fasten them up for the night, safe from wild beasts and thieving Indians.

THE INDIANS IN PENNSYLVANIA

For themselves they had no fear of the Indians, who were always friendly to the Pennsylvanians. From his earliest infancy Daniel was familiar with the silent Red Men, who came perhaps to trade their furs for the cloth and blankets that his father wove, or stood to watch the sparks that flew from the anvil in his blacksmith's shop. Or perhaps two or three of them would come on a cold winter's night to ask for shelter from the storm, and wrapping themselves in their deerskins, would lie down to sleep on the cabin floor, with their feet to the log burning on the low hearth. He soon learned to imitate them, as they glided through the forest, and it was in these early days that he gained the knowledge of their ways, which helped him out of many a difficulty in the Indian warfare in which all the settlers were forced to take a part.

In spite of hard work, he had plenty of time for play, and it was during his summer days in the woods that he laid the foundation for his fame as a hunter. At first, his only weapon was a sapling torn up by the roots and trimmed down until it was just such a weapon as the staff which David used to kill the lion and the bear. His father was very proud of his skill in bringing down game by flinging this light club, and when he was twelve years old gave him a rifle of his own. With this he soon became an unerring marksman, and henceforth kept the family larder well supplied with food, for the forests around his home swarmed with game.

THE BOONE FAMILY MOVES TO NORTH CAROLINA

When he was about sixteen, the family left Pennsylvania, and traveled down through the Shenandoah Valley into North Carolina. It was a long journey for a large family to take with their horses, cattle, implements and household goods, but they traveled slowly, and Daniel had plenty of time to go on long hunts and explore the country through which they passed. They took two years on the way, but at length they reached their destination, and settled down at Blue Lick in the Yadkin Valley.

These "Licks," of which we read so much, were very interesting places. In many parts of our country, and especially in Kentucky, there are a number of salt springs, and from time immemorial these springs were haunted by wild animals, who came to lick the salt left by the water as it flowed away. They kept the ground around the spring licked bare, and so the place was called a "lick."

EARLY DAYS IN KENTUCKY

This rather crude picture is taken from an old drawing, representing Daniel Boone and his friends rescuing his daughter and two companions from a party of Indians who had captured them. The three girls were on the Kentucky River, near the Fort at Boonesborough, when their canoe was carried to the other side by the current, and the Indians, who were hiding in the bushes, caught them and carried them off.

This picture shows the ruins of Daniel Boone's cabin at Femme Osage, in what is now the state of Missouri. When Boone left the western part of Virginia, in 1799, to find a place where he would have "elbow room," as he called it, he crossed over into Louisiana, which had been transferred by France to Spain, at the end of the French and Indian War. It became part of the United States by the Louisiana Purchase.

YOUNG BOONE GOES TO FIGHT AGAINST THE INDIANS

For the next three years Daniel lived at home, helping his father and brothers in the blacksmith shop in the winter, and in the summer going off on long hunting trips. But when he was twenty-one, war broke out with the French and Indians, and his hunting ended until it was over. The war, which is called the French and Indian, or the Seven Years' War, had been brewing for some time. A struggle was going on between the French and British for possession of the country west of the mountains. The warlike northern tribes of Indians were friendly to the French, and encouraged by them began to make raids on the Indians who were friendly to the British. Soon they became bolder, and began to attack the settlements which had been made in the valleys between the mountain chains. Then the French built forts in territory which was claimed by Virginia, and under their leadership the hostile Indians became very daring.

In 1756 General Braddock with a small army was sent from England to drive back the intruding Frenchmen, and teach their Indian allies a lesson. The expedition ended badly. General Braddock knew nothing about Indian warfare, but would not listen to the advice of the frontiersmen who were with him, because he thought they knew nothing about the profession of arms. In consequence, he fell into an ambush, and although he and his men fought bravely, they were defeated, and he himself was killed. Daniel Boone was with the army, and was in the thick of the fight.

BOONE BEGINS TO EXPLORE THE WILDERNESS

He was married shortly after this to Rebecca Bryan, the daughter of one of their nearest neighbors, and settled down to a life of hunting, trapping, blacksmithing and farming. But though he lived for many years in the little log house that he built, his days were not peaceful. Once the Indian wars had begun, they did not cease until after Canada was taken from the French in 1763, and at one time there was so much danger that Daniel thought it best to take his wife and little ones out to Virginia for a while.

But he soon came back, and took his full share in the fighting. We know that he was present at some of the battles, and once he went away down into Tennessee, —it is thought on a scouting expedition. Up to a few years ago, a tree stood on the banks of Boone Creek, in Tennessee, on which was cut an inscription reading:

D. Boon
cilled a BAR
on this tree
year
1760.

After peace came he devoted more and more of his time to hunting, and in fact made it his principal occupation. Very soon he began to think of changing his abode, for there were now a great many families living in the valley, and it is said that he liked his nearest neighbors to be so far away that he could not see their chimney smoke as it curled in the breeze.

In 1765, he set out on horseback, with seven other men, to find his way to Florida, which was then a new colony. They had a terrible journey down through the swamps, and once nearly died of hunger, for the hunting was very poor, and food hard to get. However, he reached Pensacola, and might have gone to live there, if his wife, when he told her of the trip, had not decided against it. She knew that he would be unhappy unless he had plenty of his beloved hunting.

THE "DARK AND BLOODY GROUND" CALLED KENTUCKY

Then he turned his thoughts westward to the land beyond the mountains,—Kentucky, the "dark and bloody ground" of the Indians, of which he had heard many wonderful tales.

He made an attempt to find it in 1767, and, with one companion, actually spent the winter there without knowing that he had reached it, but it was not until 1769 that he set out on the expedition that made him one of the founders of the state. It was his report, based on observations made on this second trip, which induced Colonel Henderson to organize the famous Transylvania Company.

This time, he and his companions penetrated into the country. They climbed up over the Blue Ridge Mountains, the Stone and Iron Mountains, through Moccasin Gap of Clinch Mountain, through Powell's Valley, up a hunter's trail through Cumberland Gap until they

struck the "Warrior's Path," beaten by the feet of generations of Indian war parties, and so down into the forests of Kentucky.

ALONE IN THE WOODS

Daniel did not leave Kentucky, the land of his dreams, for two years, and twice was left alone for months, without even a dog as companion. But during these lonely months he was not idle. He wandered all over the country, exploring it in every direction, noting its beauties, its well-watered plains and valleys, and storing up in his active mind knowledge that was of great value to the settlers who followed him into this fertile region. His brother Squire, who had been his companion during the year, came back in December, and they spent another winter in the woods. But this time they fell in with another party of hunters who met them in a curious way. One evening when these men were making camp, they heard what, in that place, was a most extraordinary noise. Motioning his companions to be silent, the leader crept cautiously forward and presently came on Daniel Boone, lying flat on his back and happily singing at the top of his voice as he waited for his brother.

Boone was delighted with the Kentucky country, and in 1773 persuaded a number of families to join in attempting to make a settlement there. But one night, when they were on the way, his eldest son and some companions were surprised and killed by Indians, and overcome with sorrow and fright, the little party decided not to go on. Boone and his family stayed for a time in Western Virginia, and the others went back to their old homes.

BOONE IN "LORD DUNMORE'S WAR"

A new war now broke out with the Indians, who had been greatly angered by the treatment they had received from the white men. Boone did good service in this war, which is known in history as "Lord Dunmore's War," and received great praise for his work. During this war he was sent to warn some scattered parties of their danger, and traveled eight hundred miles in sixty days through woods which were alive with Indians.

The Indians were soon subdued, and when peace came the settlement of Kentucky was seriously begun. The new effort was made, on a much larger scale than before, by the Transylvania Company, with Colonel Richard Henderson at its head, and Daniel Boone for one of the leaders. Early in 1775 the first party of settlers reached Big Lick on the Kentucky, by the path which has since been marked out by the Daughters of the Revolution. They at once began to build a fort, and Boone turned surveyor, laid out the site of a town, to be called Boonesborough, and planned the fort. Outside this fort there was a great elm tree, and under its shade the first assembly ever held in Kentucky met to make laws to govern the little community.

THE GROWTH OF KENTUCKY HINDERED BY WAR

In spite of various drawbacks, the little colony grew steadily. Boone and a number of the other settlers brought their wives and families, and prosperity seemed in sight. But the War of the Revolution broke out and the Indians who were allied to the British commenced to raid the weak settlements. The first warning that the Boonesborough settlers had of their peril was the kidnaping of Boone's daughter Jemima and her two friends, Betsey and Fanny Calloway. The three girls were paddling on the Kentucky one Sunday afternoon when their canoe was carried by the current to the opposite bank, and they were captured by five Indians who had been watching the fort from the bushes. Colonel Calloway, the father of Betsey and Fanny, followed in hot pursuit with a party of mounted men. Boone, leading a party on foot, followed the trail and, guided by the scraps of clothing and bruised twigs which the brave girls contrived to leave in the path, caught up with them and rescued them.

BOONE TAKEN CAPTIVE BY INDIANS

The war times were gloomy days for Kentucky. Provisions were scarce, and game was hard to get, for there was always danger of surprise from the Indians. Boone's fort was often attacked, and once he was wounded and barely escaped with his life. Another time, when he had gone into camp at Blue Lick to make salt, he was captured by a war party of Indians who were on their way to attack Boonesborough. He knew that the fort was not ready for defence, and in desperation promised the Indians that if they would put off the attack until spring,

he would persuade his companions to surrender to them. The Indians made the promise, thinking that he would lead them in the spring, when they could comfortably and safely carry off the whole community. The other members of his party listened to his persuasions, and these brave men, to save their families and friends, voluntarily went into what they knew would be a hard and bitter captivity. All through the winter they were dragged about the country from place to place, going even as far as Detroit.

In the spring, when the Indians were gathering for the attack on the settlements, Boone managed to escape and, without food, traveled steadily on towards the fort. He reached it in four days, walking forty miles a day, having eaten only one meal during the whole journey.

THE FAMOUS SIEGE OF BOONESBOROUGH

The fort was quite unprepared for an attack, but he set the people vigorously to work, and soon had everything in readiness. However, the Indians did not reach the fort until September, when they appeared in large force, and the siege of Boonesborough, which lasted for ten days, is famous in the annals of Kentucky. At times the settlers almost despaired; but at last, to their joy, the noise of shouting and fighting suddenly quieted down, and the Indians silently disappeared in the forest.

For years the settlers in Kentucky endured hardships and suffered many things from the Indians, who continued to harass the settlements even after the War of Independence came to an end, and they were no longer supported by the British. In spite of sorrow and hardships, however, the country continued to fill up, and Boone was in great demand as a surveyor. His knowledge of the Indians and his calm bravery and patience made him a tower of strength. He was made lieutenant of his county, town trustee, and was sent as representative to the legislature at Richmond.

BOONE LOSES HIS LAND THROUGH CARELESSNESS

He does not appear to have been a good business man, and in spite of the fact that he was a surveyor and must have known the regulations, he failed to file his own land claims. As a consequence, new settlers registered claims against the property which he had marked for his own, and then brought suit against him to obtain possession of them. As he had failed to comply with the law, the courts could

After Daniel Boone moved over into that part of Louisiana, which is now the state of Missouri, the Spanish governor made him syndic, or magistrate. While he held office, he held his court under this tree, which is now called the "Judgment Tree."

do nothing for him, and he found himself without an acre of ground in his beloved Kentucky. Sadly disappointed, he left it and went back to Western Virginia, where he lived at the little village of Point Pleasant in the Kanawha Valley for a number of years. He was held in great esteem by the people of Virginia, who again sent him to the Assembly at Richmond, though he cannot be said to have been a brilliant success as a legislator.

After the final defeat of the Indians by General Anthony Wayne, more people began to arrive in Kanawha Valley, and again Boone felt that he must move so that he might have "elbow room" as he expressed it. Some members of his family had gone down in 1799 to Missouri—then under Spanish rule—and there he followed them in the following spring with his wife and family and all his possessions. They went by water, and we can imagine the picturesque little procession as it followed the shores of Kentucky down the broad Ohio.

He was very happy for a few years in Missouri. He received a large tract of

land from the government, had plenty of room, good hunting, and was made magistrate of his district, an office in which he was very popular.

BOONE AGAIN HAS TROUBLE ABOUT LAND TITLES

But after what is known as the Louisiana Purchase, Missouri came under the government of the United States, and again we have a repetition of the old story. Where the pioneers had gone, others followed, the land was broken up for cultivation, the Indians moved away, and the wild animals were killed off, or fled before civilization.

Under the new laws, Boone lost his office, and for some time had a good deal of trouble about his lands, because he had again neglected to see that his title was registered. However, this difficulty was settled happily by the government making a special grant to him of a thousand acres. He did not move again, for he was now an old man, but contented himself with making long hunting trips, and once, it is said, went as far as the region of Yellowstone Park.

In 1813, he was greatly saddened by the loss of his wife, and after her death left the little house in which they had lived for years, and for the remainder of his life was tenderly cared for by his sons, to whom he had sold his land, so that he might pay some debts which he owed in Kentucky. He lived until 1820, always happy and active, going off sometimes on a hunting trip, sometimes working a little on the farm.

At the time of his death, there was in session, in St. Louis, a convention to draft a constitution for the state of Missouri, which had applied for admission to the Union. Upon hearing the news of his death, the delegates to the convention adjourned for the day as a token of the respect in which he was held, and each member wore a band of crape on his left arm as a sign of mourning.

A PIONEER HOME

This is the kind of home which the pioneers built on the edge of the wilderness. The men have felled trees, in clearing the ground for cultivation, and are dragging them into a heap to burn them. During his adventurous life, Boone must have assisted many times at such a scene as this.

KENTUCKY ERECTS A MONUMENT TO BOONE

Some years after his death, the people of Kentucky felt that some honor should be shown to Boone, and a monument was built to his memory at Frankfort, the capital city. He was not the first man to explore the region, nor even the first to settle in it, but they realized that he was the best type of pioneer, and that in honoring him they honored what was greatest in the men who had taken their lives in their hands and gone out into the wilderness to build a nation.

JAMES ROBERTSON OF TENNESSEE

WHILE Daniel Boone was helping to build the state of Kentucky, the same work was being done in Tennessee by James Robertson. Robertson, who was a few years younger than Boone, was born in Virginia. We know little of his early years, except that while he was only a child, his family moved to North Carolina. Of course, he learned to hunt and shoot, and knew all the trees and plants, and the birds and animals of the woods, how they lived, and where they made their homes. Every boy of pioneer days learned these things, or was counted of not much use to his community. But he never went to school, for it is probable that he was out of reach of one, and his father was poor. When he was about twenty-six, Robertson married, and his young wife took time, from all the other tasks that fell to the lot of a pioneer's wife, to teach him how to read and write.

When he had been married about two years, Robertson decided to go in search of a place where he could make a new settlement. With nothing but his horse and his rifle for company, he crossed the mountains and found himself in the lovely Watauga Valley, where there were already a few settlers as adventurous as himself. He stayed long enough to prove the fertility of the land by growing a field of corn, and then recrossed the mountains to bring his family back to build the new home that he planned.

On the long journey back through the mountains he lost his way and his horse, and if he had not been rescued by hunters, he would have lost his life; but he reached home safely, and so full of enthusiasm that sixteen other families determined to join him when he set out in the spring.

A LONG JOURNEY TO A NEW HOME

Many of us know the discomforts of moving even from one comfortable house to another, though with the aid of skilled packers, who take every care of our treasured belongings. But can you imagine the moving of those seventeen families who set out to make the Watauga settlement? Early in the spring, everything that could be carried on the backs of horses was packed, the things that could not be taken were sold or given to neighbors, the door of the old home was closed, and each family set out for the meeting place. There the sadness felt at leaving the old home was forgotten in the feeling of adventure. With the leader at the head of the column, the women and children on horseback, the men trudging at the horses' heads and keeping vigilant watch, and the boys ranging the forest on either side, or driving the cattle that they brought with them, the little party went forward with high hopes. At night they camped, and you can imagine the delicious feeling of safe fear with which a little boy went to sleep under the starlight, in his father's strong arms, or a little girl nestled close beside her mother, near the fire, sure that any prowling Indians or bears or wolves would fall before the unerring aim of the men on watch.

They arrived safely at the Watauga and the men soon built the log cabins that were to be their homes, and gradually made the simple furniture that had to fill their needs in the early years of the settlement. Trees were cut down to clear the fields, and the land was tilled. The next year John Sevier, also a native of Virginia, joined the settlement, and he and Robertson became the leaders of the little community.

THE LITTLE SETTLEMENT FORMS A GOVERNMENT

The Watauga Valley, in which the new settlement was made, was far from the older settlements and the towns where the courts of law were held. So the men met in convention and decided to form a government of their own. They drew up a written constitution known as the "Articles of the Watauga Association" and elected a little assembly of thirteen representatives to govern them. From among the representatives five were chosen, and these men formed a court to try all cases of wrong-doing.

That same year Robertson and another man made a treaty with the Cherokee Indians who lived near by. To celebrate the treaty, sports were held, to which the Indians were invited, and a feast was made. But some bad men who were prowling around in the woods killed an Indian, and the whole party left the settlement vowing vengeance upon it. Not a moment was to be lost. Leaving Sevier and the other men to build a strong fort as a place of refuge, Robertson set out alone to make peace with the Indians.

Although he knew that they might torture him to death, he followed them through the forest, and when he came up with them apologized for the action of the wrong-doer and won them over completely by his fearlessness and courtesy.

ANOTHER MOVE THROUGH THE LONELY WILDERNESS

Robertson prospered in Watauga, but about eight years after he settled there, he determined to go further afield. This time he made up his mind that before the moving began there should be some houses for the people to move into. So, in the spring, he and eight other men climbed the Cumberland Mountains and went down the other side into the land that lies between the Cumberland and the Tennessee. They traveled as far as French Lick, which they decided was a good place for a settlement, and there they planted a large field of corn and built log cabins. When the work was done, three men stayed to guard the crop and the houses, and the others went back to Watauga to show the way to the men and women who were to make the new settlement.

Most of the younger men of Robertson's party followed him through the mountains to the Cumberland Valley. It was a toilsome road, however. It was thought that the river would be an easier way for the women and children to take, and with a few men, they went round by boat. Look at your map, and you can easily follow the adventurous voyage taken in the winter of 1780 by so many boys and girls, some of them perhaps the ancestors of some of our readers. The party, we are told, left Cloud Creek, on February 27, 1780, under command of John Donelson, a friend of Robertson. They floated down the Tennessee until they reached the Ohio, rowed and paddled up the Ohio to the Cumberland, and up the Cumberland to Big Salt Lick, where Robertson met them. Two months had been spent on the way and much of the time they had been in peril from Indians, and toward the end, they were sometimes hungry.

No sooner were the people settled down in fixed habitations than Robertson and Colonel Richard Henderson, who had been associated with Boone, helped to organize a government. Representatives were chosen by each of the little villages in the settlement, and the representatives met in Nashborough, the central fort, which was built where Nashville now stands. Robertson was made chairman of the court, and colonel of the militia, and seems to have been looked upon as the natural leader of the whole community. He was one of those men who seem born to lead others, not because of birth or education, but because of bravery, good judgment, and high character.

HARD DAYS OF INDIAN WARFARE ON THE FRONTIER

Before long the Indians attacked the new settlement and the settlers were kept constantly on the alert. Some families deserted their clearings and went back to their old homes. Others wanted to go but Robertson persuaded them that to face the dangers was the braver part, and heartened by his strength, they stayed and were able to fight off their attackers. As winter came on the powder and bullets began to run short, and the dauntless Robertson went alone through the woods to Kentucky, where he got a supply, and brought it back just in time to beat off two attacks made by the Indians.

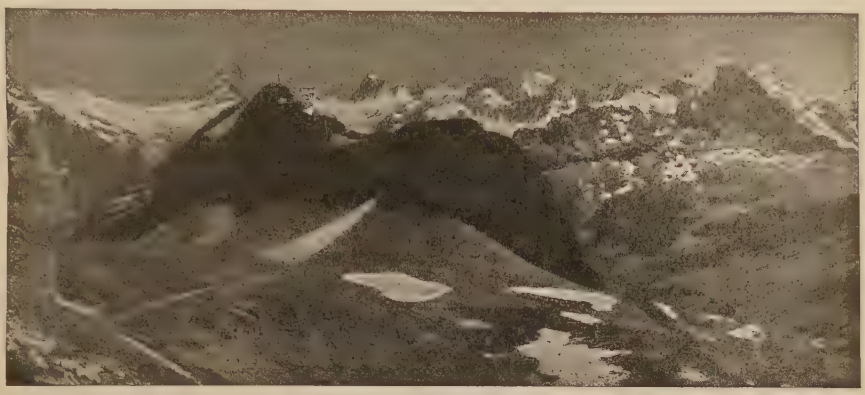
Robertson suffered much hardship during the years of Indian warfare which came after the Revolution. One of his sons was killed, and he, himself, was wounded and almost captured. But the great-hearted man was a tower of strength to the people of the Cumberland region. We find him promising that a road should be built and seeing that it should be done, organizing armed forces and leading an expedition against the Indians, and persuading new settlers to come into the district, for he knew that the only way to quiet the Indians was to overawe them by filling the country with white people. Many strong men and women did come in. By degrees the country filled up with comfortable farms, and except on the border, the warfare died out.

All this time the country which is now Tennessee had been part of North Carolina. In 1791, however, North Carolina ceded it to the nation, and it was made the Territory of Tennessee. Robertson was put in command of the militia in the western part of the territory, and a few years after the State of Tennessee was admitted to the Union he was made a state senator. He died in 1814 at the age of sixty-eight, and his memory is honored to the present day.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 6349.

AN IMAGINARY VIEW OF THE TRAIN RUNNING THROUGH TUNNEL UNDER THE ALPS

More than a mile below the tops of the mighty mountains rushes the brilliantly lighted train, with its load of perhaps five hundred passengers. The artist here shows us an imaginary section under the Alps, with children above, all unconscious of the fact that, could they but see through the solid rock, the train would appear below, like a fiery serpent boring its way through the black mass beneath them.



The greatest mass of mountains in Europe, through parts of which the Simplon Tunnel runs.

BORING THROUGH THE ALPS

THE MOST WONDERFUL WAY EVER MADE

CONTINUED FROM 6214

THE story of the boring of the famous tunnels through the Alps is like a fairy tale. There are three of these tunnels—the St. Gothard, the Mont Cenis, and the Simplon—and through them, every day, hundreds of travelers pass out of Switzerland into Italy, beneath the Alps, in the very heart of the greatest mountains in Europe, with millions of tons of earth stretching for more than a mile between them and the sky.

Let us take one of these tunnels only—the Simplon. The work occupied 10,000 men nearly eight years, and cost over fifteen million dollars. When Hannibal crossed the Alps with his army, it took him fifteen days, and cost an enormous number of lives. Napoleon took five days to cross when he set out to conquer Italy. He did not forget the difficulties of the crossing, and when he became emperor he built the Simplon Road running along the Simplon Pass, over a shoulder of the mountain, and rising to a height of 6,600 feet. It is 42 miles long; it is carried over 611 bridges, through many galleries and short tunnels cut in the rock, or built of solid masonry to protect the traveler from the swift rush of avalanches in winter. Until the opening of the Simplon Tunnel, that was the only way over the Alps at this point. The Alps are pierced by two other famous tunnels—the Mont Cenis and the St. Gothard—but they are far away from the Simplon.

There are two features in which the Simplon Tunnel differs from all others. Being 12¼ miles in length, it is longer than any other railway tunnel in the world. A more remarkable point is the immense distance beneath the surface at which it runs. When we reach the highest point to which the tunnel climbs in the heart of the mountain, we have still more than a mile of solid rock above us. It could have been made much nearer the top of the mountain, but that would have meant a very high climb for the trains before reaching the tunnel. On the north, or Swiss, side the entrance is 2,249 feet above sea-level, while on the Italian side it is 2,079 feet. The tunnel slowly rises till it reaches a height of 2,310 feet. Above that lies a mass of mountain more than a mile high. At one point it is 7,005 feet below the surface. The tunnel slopes slightly towards each end, so that any water which enters may run down the slopes and escape. The tunnel is

double: that is, there are two parallel tunnels 56 feet apart, each carrying one line of railway. This plan greatly helped ventilation, and ensured the health of the men.

The engineers expected to find great heat—for the deeper we go in the earth the higher the temperature rises. They expected to find a heat of about 100 degrees, but when they came to the worst part they met a heat of 132 degrees, while hot water flowed in. There were rivers and lakes hidden in the mountains of which they had previously known nothing. There were soft parts, too, in the mountains, which they had not expected to find.

The two ends of the tunnel—Brigue on the Swiss side, and Iselle on the Italian—became cities of industry. The Rhone at the Swiss end and the Diveria at the Italian were harnessed and made to supply power for driving the many kinds of machinery which were used. A new colony sprang into existence at each end of the tunnel, in which were comfortable homes for the workmen and their families, cafés, hospitals, places of amusement.

Everywhere these little towns were lighted by electricity, made by the running of the harnessed rivers. The comfort of the workmen was looked after. They had special clothes to work in, warm and cold shower-baths, and cooling chambers were furnished, to prevent their feeling the cold on coming out from the hot depths of the mountain into the chill atmosphere of the Alps. Machinery forced in enormous quantities of cold, pure air, and drew out the foul air. Few horses were allowed in the tunnel, because they made the air impure; and special watering machinery instantly converted the dust into mud, so that the men should not breathe it. The conditions were excellent, and the men worked with extraordinary goodwill. When the St. Gothard tunnel was built the death-rate among the working force was 800 in eight years. During the seven years' work on the Simplon, only 60 deaths occurred.

Work was begun at both ends of the tunnel at once—with 6,000 men on the Italian side, where the harder work was expected, and 4,000 men on the Swiss side. Drills driven by hydraulic power were used to bore holes in the rock, and in the holes thus made charges of dynamite were placed and fired. Water under heavy pressure smashed up the rock which the dynamite dislodged, and long trains carried away the rubbish and brought in building material, so that solid masonry could be built to form walls, and give extra support. Day and night men were at work, working in shifts of eight hours each. All the machinery for the work had to be specially made, and with this the men bored away 18 feet a day. The men on the Italian side worked toward the Swiss side, and those on the Swiss side toward the Italian.

For a time all went well. Soon, however, those on the Italian side met with unlooked-for difficulties. They broke into soft and treacherous ground, where they had expected to meet solid rock. To make this secure, they erected enormous timbers, but these were crushed. Next, heavy steel girders were tried, but so great was the pressure above and all round that these became twisted like wires. Not until quick-drying concrete was built round them could the girders be made to hold up.

Then the workmen came upon an underground river of intensely cold water. It rushed into the galleries at the rate of 10,564 gallons a minute. That gives nearly 100,000 tons of water in the course of the day and night, enough to supply all the wants of a large city. The coldness of the water reduced the temperature to 55 degrees, the lowest point recorded.

The men worked in waterproofs and rubber boots and leggings, but they were in a shower-bath the whole time, and up to their knees in water, and often in danger of drowning. Drainage systems had to be constructed to carry away this river, and, after a delay of six months, the danger-spot was safely passed.

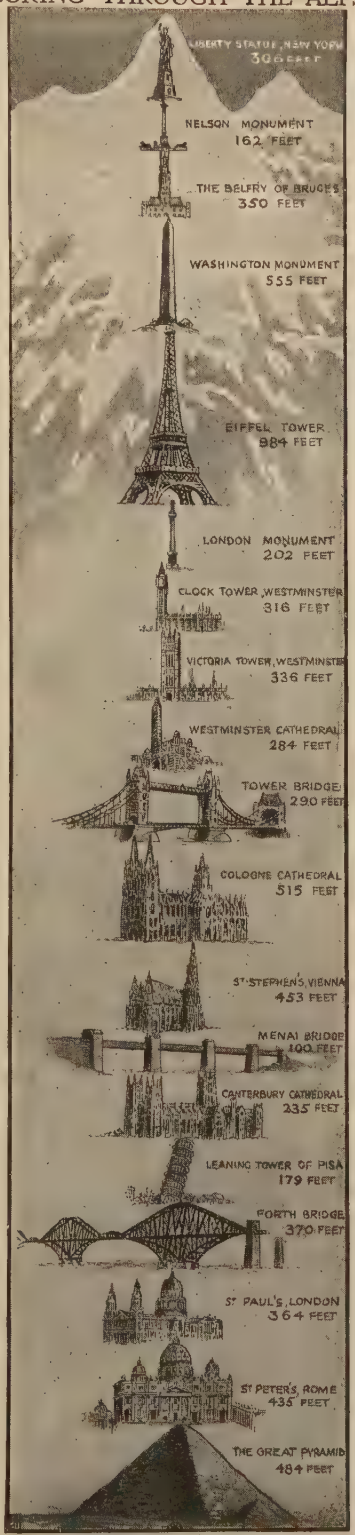
Very soon afterwards, however, the rocks into which they were boring began to get hotter, and streams of hot water gushed out. Having passed a river of cold water, they had now come upon another, which filtered down through the scorching rocks. It flowed into the galleries at the rate of nearly 100,000 gallons an hour—a river of scalding water. Nobody on the spot dreamed of giving up the work, though everybody outside thought that the task must be abandoned. The men on the Swiss side

also had come upon baking rocks and hot water. The same idea was adopted for both sides of the tunnel. On the Swiss side powerful machinery pumped in cold water from beyond the end of the tunnel upon the burning rocks and upon the cracks from which the scalding water issued, and so cooled both rock and water. Cold water was also sprayed in the air.

The plan on the Swiss side worked well, until a great storm at that end of the tunnel caused a landslide, which cut off the water supply. The hot water was still pouring in, so the engineers had to put up enormously strong iron doors, right across the tunnel. This, to a great extent, shut out the flow of hot water, and enabled the men to go on building up the walls in the rest of the tunnel. And there they had to leave their boring, and wait for the men on the Italian side to work their way through.

The brave fellows on the Italian side worked doggedly on. They now turned one river against another. The cold river through which they had fought their way was made to serve the pumps, and to help to cool the scorching rocks and water where their present work lay.

Little by little they worked their way onwards to the spot where they expected to break through. They knew exactly the spot at which they *should* break through and make the tunnel complete. They had been for years working in what they hoped was a straight line. Had they gone straight, or had they gone astray, and might they have to go on boring, and find that they had missed the line that they should have followed?



These 19 high buildings could stand like this between the mountain-top and the trains.

At last the men on the Swiss side heard the sound of the drills, and knew that the others were approaching them. Twenty feet, nineteen feet, then only sixteen feet remained, and so the last barrier was gradually bitten away by the drills. Then came the last charge of dynamite which was to open the way. It was put in and fired, and a hole in the rock eight feet wide opened. The tunnel was complete! After twelve miles of boring, starting from different countries, the workmen met in the heart of the Alps.

In May, 1906, the King of Italy and the President of Switzerland met in the tunnel, and a month later, nearly eight years from the beginning of the work, trains were running through the Simplon, the longest and deepest of all the tunnels in the world. The trains are drawn through by electric locomotives.

The route became so popular that a new or second Simplon tunnel was necessary. By 1915 the length of completed tunnel at the north and south ends was half done. The work was then seriously interfered with by the drafting of workmen for the Italian army, as so many great undertakings have been stopped by the greatest war in history.

WHERE THE UNSEEN TRAINS RUSH PAST

For thousands of years the famous Simplon Pass, shown in this picture, was the principal route across the Alps, but since 1906, when the Simplon Tunnel that had been bored through the solid mass of the mountains was opened, the pass has been very little used. The splendid road was built by Napoleon. Now, instead of plodding or driving across this road, travelers dash through the mountains unseen by the mountaineers.

THE CRASH, CRASH OF AN AVALANCHE

This picture gives some idea of the scene of terror when an avalanche crashes down the mountain-side. A very small cause will set the mass of overloaded snow in motion. The Simplon tunnel was built not only in order to shorten the route but also to avoid the possibility of a railway being blocked by an avalanche.

BLOWING UP A MOUNTAIN FROM INSIDE

The great tunnel was made by blowing a passage through the mountains with explosives. After drills had bored holes in the face of the rock, cartridges were inserted and a man set light to them, as shown.

In firing cartridges, a time-fuse was used—a match that would burn for a time before exploding a cartridge —in order that the workmen could get to a place of safety. Here we see the tunnel after an explosion.

HIDDEN RIVERS OF HOT AND COLD WATER

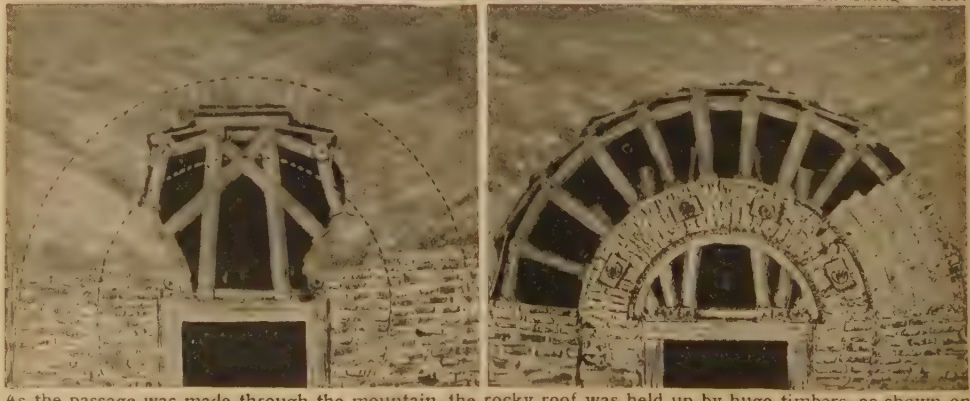
After blowing away the rock, the men were often in danger of being drowned by inrushing water from springs that had been let loose. Sometimes the water was very hot, like that shown in this picture.

Many times the springs rushed in like a torrent, and here we see a cold spring that was tapped, pouring 15,000 gallons of water a minute into the workings. This caused a delay of six months in the work.

THE LITTLE PIPES THAT PIERCED THE ALPS

It is really to these wonderful machines that we owe the tunnel. By means of a stream of water driven at tremendous pressure, a little pipe with a jagged end is turned round and round, eating away the rock.

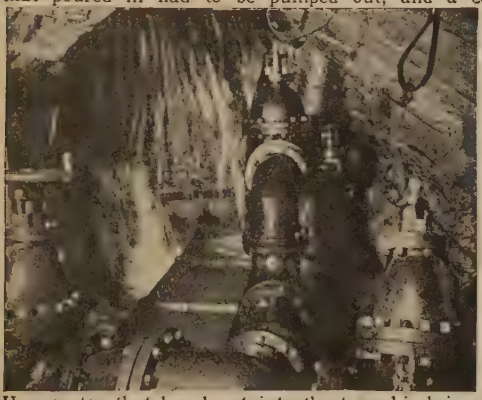
For a great part of its length, two passages were excavated, as shown here, and then the dividing wall was removed. This plan made easier the ventilation of the tunnel and the removal of inrushing water.



As the passage was made through the mountain, the rocky roof was held up by huge timbers, as shown on the left. Then steel frames with more timber were erected, as on right, and stone walls were built in.

WATER PUMPED OUT AND AIR PUMPED IN

Tunneling was made possible by the work of huge pumps like the one shown here. Vast volumes of water that poured in had to be pumped out, and a constant supply of fresh air had to be pumped in.



Here water that has burst into the tunnel is being driven into the mouth by a great pump. Flooding was one of the greatest troubles during the work.

Not only was air driven in for breathing purposes, but the locomotives used by the workmen in making the tunnel were driven by compressed air.

In the heart of the mountains, especially where hot springs were tapped, the heat was so intense that only by means of spraying cold water upon the walls to cool them, was it possible for the men to work.

A HORSE IN THE HEART OF A MOUNTAIN

This picture shows a horse inside the Alps. Our ancestors would have laughed at such an idea. Owing to the difficulties of photographing in the tunnel, the front of the horse is larger than it should be.

While the tunnel was being bored, the roof was supported by huge wooden beams; in some parts the pressure of water and loose rock was so great as to break massive beams, and even bend steel girders.

A THRILLING MEETING INSIDE THE ALPS

By means of a theodolite, which is the surveyor's chief help, the workmen were able to start boring on both sides of the Alps, and they met in the middle. The last wall of rock is about to be pierced.

This illustration shows one of the most thrilling moments in the making of the great tunnel. The workmen on the Italian side have just pierced the last rocky barrier that separates them from their Swiss comrades.

WHERE THE TRAINS COME BACK TO LIGHT

The Simplon Tunnel, the longest in the world, runs through the Alps from Brigue in Switzerland to Iselle in Italy. This picture shows Brigue, and on the left can be seen the double entrance to the tunnel.

This is the Iselle entrance to tunnel. In boring this passage, one of the world's greatest engineering feats, 3,740,000 holes were drilled, 1,496 tons of dynamite exploded, and 1,229,500 cubic yards of rock excavated.

CONTINUED ON PAGE 6311.

WHAT THIS STORY TELLS US

YOUR editors have admired Sir Walter Raleigh from their boyhood, and in other volumes of our book you will find much said about him. His most important claim to the admiration of American boys and girls has been hardly mentioned, however, and this story will tell you why Americans should respect his memory. He had the idea of building up a new England in America, and gave much of his money, and spent much of his time to bring it about, only to fail in the end. The failure was not his fault but was a great grief to him. The story of the "Lost Colony of Roanoke" is one of the most romantic in American history, and we wonder about the fate of little Virginia Dare.

THE LOST COLONY OF ROANOKE

CONTINUED FROM 6142

THE first expeditions to the New World were not sent with the idea of permanent settlement. They spent their time looking for the passage to India and China, or else sought only gold and silver. Walter Raleigh, and his half-brother, Sir Humphrey Gilbert, were among the first Englishmen who desired to set up "little pieces of England" in America. They started with seven small ships in 1578, but whether to explore America or to capture Spanish treasure ships is not quite certain. At any rate they had a fight with the Spaniards, and returned without success. Sir Humphrey Gilbert was lost at sea, returning from a voyage to Newfoundland in 1583, but Raleigh was not discouraged.

The next year Queen Elizabeth made him a knight, and gave him permission to settle any "remote heathen and barbarous lands," still unoccupied by Europeans, giving the people who should settle there all the rights of Englishmen, including the right to make their own laws.

TWO LITTLE SHIPS SENT OUT TO EXPLORE THE LAND

Raleigh soon sent out two little ships commanded by Philip Amadas and Arthur Barlowe. They touched Florida, and then sailed along the coast until they reached what is now North Carolina, July 4, 1584. Following the coast they came to a gap in the sand banks which fringe the coast and entered Pamlico Sound. They landed upon an island, which to their eyes seemed a paradise. The stately pines, the cedars, and the abundance of grapes, which they reported grew down to the water's edge, so that "the very beating and surge of the sea overflowed them," filled them with wonder. Game and fish were also plentiful. The Indians called the island Roanoke.

The Indians were friendly and brought them fish, and were much pleased with a few trifles given them. The explorers visited the Indian village, and were charmed with all they saw. Two of the Indians agreed to go to England with them. The name of one was Manteo, and the little town on the island to-day bears his name. The whole country was named Virginia, in honor of Queen Elizabeth, sometimes called the "Virgin Queen."

Sir Walter Raleigh was delighted with the report of his explorers, and early in 1585 sent out over a hundred men under Ralph Lane to found a colony. Unfortunately Sir Richard Grenville, who commanded the ships which took them over, quarreled with the Indians and set fire to their corn.

THE FIRST COLONY AT ROANOKE DOES NOT PROSPER

The little colony built a little fort, but seems to have spent more time exploring and hunting gold than in planting crops. Some of them followed the broad Roanoke River, hop-

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ing to find a passage to China. One of the party was John White, who had some skill in drawing. He made pictures in water-colors of the Indians, at work and at play, and of their houses. Some of these were published at Frankfort, in Germany, in 1590, five years after they were made, to illustrate the story of the expedition, written by Thomas Hariot, the famous mathematician. Both story and pictures tell us much of Indian customs, before they were changed by the white men. The pictures themselves are in the British Museum in London. We show you here some photographs of the drawings.

As the Indians refused to sell their corn, the party began to suffer for want of food the next year, and the expected supplies did not come from England. Just at this time Sir Francis Drake, of whom you may read on page 862, stopped on his way home from an expedition against the Spaniards. He agreed to take the hungry, homesick men home, as they asked, and the island was deserted.

A little while later Sir Richard Grenville arrived with the supplies which had been delayed, only to find the island uninhabited. He could not believe that all the men were dead, and did not guess that they had gone back to England. He thought that they were somewhere on the mainland, hunting gold or trying to get to China, and so he left abundant supplies, with a guard of fifteen men, and sailed back to England.

All England was then stirred up over the war with Spain, which all saw was coming, but Sir Walter Raleigh would not give up the idea of planting a colony. So in the next year, 1587, he sent out another colony, of about one hundred and fifty men, women and children, under John White, who drew the pictures we show you here. Governor White was ordered to go to Roanoke Island, get the supplies and the fifteen men left there the year before, and then go further north into Chesapeake Bay, where there were better harbors. The commander of the ships, however, was anxious to get back to Europe, and after a part of the men had gone to Roanoke Island in a small ship, he landed all the rest on the coast, and sailed away. So the third colony was forced to settle in the same place.

This in one of John White's pictures, showing in the foreground two Indian hunters, and behind other hunters chasing the deer. You can easily distinguish the figures he drew from life and those for which he drew upon his imagination. The physical strength of these men seems to have impressed the artist very much, and he brings out their muscles very carefully.

HOW THE SOUTHERN INDIANS COOKED

The methods of cooking among the Indians seem to have interested the first Europeans who came to America very much. The two pictures on this page show that the Indians on the North Carolina coast did not suffer for want of food. The earliest explorers tell us all kinds of food were plentiful. Here we see the preparation of a sort of stew, of fish, green corn and other things hard to recognize.

The waters of North Carolina to this day abound in fish of every description, and here is the simple method of cookery common among the Indians. Several varieties seen in the picture may be recognized by every one who has studied fish. The report of Sir Walter Raleigh's first expedition says that an Indian caught all that the ships could use in a very short time. Several were entirely new to the Englishmen.

THE THIRD COLONY, AND LITTLE VIRGINIA DARE

The party looked in vain for the fifteen men and the supplies, when it reached the island, but found only a skeleton here and there. The Indians had killed the men and taken all of the supplies they fancied. Since the ship had sailed away, the colony had to remain, and all set to work to build huts. In the party was the governor's daughter, Eleanor White, who was the wife of Ananias Dare. To them was born, August 18, 1587, soon after they landed, a little daughter whom they named Virginia in honor of the country. This little girl, Virginia Dare, was the first child born of English parents in what is now the United States. The county of North Carolina, of which Roanoke Island is a part, is called Dare County in her honor.

Since the Indians had not only killed the men, but had taken or destroyed the stores and supplies they were set to guard, the colony had great need of many things in order to live. Governor White, therefore, thought it necessary to take the one little ship left them and start back to England for help, when his little granddaughter was about a week old.

When he arrived in England the great Armada, which Philip of Spain expected to conquer England, was almost ready, and every ship in England was being prepared to fight. Sir Walter Raleigh made two attempts to send aid to his little colony. Once the ships were seized for the government, and the second expedition, under Governor White, was driven back by Spanish ships. Then came the Armada, about which you may read on page 862, and there were many months of fighting, in which Raleigh had a prominent part.

Finally poor Governor White, who must have been almost distracted, arranged with a sea-captain sailing to the West Indies to take him as a passenger, and to stop at Roanoke Island on his return voyage. Finally, in August, 1590,

We are told that this picture represents a solemn festival dance among the Indians of what is now North Carolina, as seen by an Englishman more than 325 years ago. The savages, almost naked, danced around the circle of posts, striking them with their rattles as they passed. The one who could dance the longest and jump the highest was considered the winner.

when his little granddaughter would have been three years old, he reached Roanoke Island.

GOVERNOR WHITE DOES NOT FIND HIS GRANDDAUGHTER

On the island there was not a sign of human life; the doors of the huts stood open, and grass grew in the fort. Chests and boxes which had been buried had been dug up. Some of Governor White's books and drawings had been scattered to the winds. There were no signs of a struggle, and the only clew was the word CROATOAN carved deep on a great tree.

The ship proceeded toward that place, but one of those severe storms common on that coast sprang up and after beating about for several days the captain, in spite of the prayers of the father and grandfather, set sail for England, leaving the colonists to their fate.

Raleigh made two further efforts to find his colony, five in all, and after the failure of his last, in 1602, just before he was imprisoned, declared that he would yet see "an English nation in Virginia." He was sent to prison by James I, in 1603, and finally put to death in 1616. Before his death the colony of Jamestown had been founded by others and the weak little colony managed to exist.

WHAT BECAME OF THE LOST COLONY OF ROANOKE

The settlers at Jamestown, after their arrival in 1607, were told that this colony had lived peacefully among the Indians for several years, adopting the Indian mode of life. Finally the medicine-men had stirred up the tribe to murder all except four men, two boys and a girl. Perhaps this story was true, perhaps not. If so, was this girl Virginia Dare?

To this day many believe that some of the colonists, at least, were adopted by the Indians, and married with them. As proof they point to the gray eyes and red hair sometimes seen among the Croatan Indians, who yet live in North Carolina. The Indians themselves say that they have been told by their grandfathers, who were told by their grandfathers, that their ancestors came over the sea and could "speak out of a book." All we really know is that the little colony disappeared, and has never been found.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 6387.

Though Sir Walter Raleigh's attempts to found a colony in the New World failed, he was not forgotten. When North Carolina became a state it named the new town, built for the capital of the state, Raleigh, in his honor. This is the dignified capitol building in the centre of the town which reminds the people of the state of the great man who tried so faithfully to settle the country. Photograph by Brown Bros.

A MONSTER SHIP OF THE SKIES RETURNING FROM PATROL

The balloons of twenty years ago were small affairs at the mercy of every wind. Now they carry dozens of passengers, or fighting men, their engines drive them against the wind, and their rudders guide them. This is one of the giant airships used by the British. Notice the gun mounted on top and the two propellers on the car. The markings are to enable their own men to identify them, so that they will not be fired upon by their friends. These balloons are made in sections, so that if one of the gas chambers should be pierced it would not fall to the ground. In the ordinary balloon a small hole would empty the whole gas bag.

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WHAT THIS STORY TELLS US

THE two great sports of the United States are baseball and football. Baseball is played by a great many more people, for thousands of boys and young men play the game at every opportunity. Fewer play football, but the public interest in the game is quite as great. The following description gives a general idea of the game, and will enable the reader to understand.

HOW TO PLAY FOOTBALL

Continued from 6170

DURING the autumn months of every year, thousands of American boys and young men are playing football. It is the favorite sport in colleges and high schools, and the newspapers print long accounts of the games, some of which are attended by many thousands of spectators.

It is a rough game and a boy who is not strong should not attempt to play it. Even strong boys are sometimes hurt, and, therefore, some parents and some schools object to the game, and do not allow their boys to play. However, if only strong boys, wearing proper clothes, play the game, there is not much danger of serious injury. Players should always wear regular padded football clothes, and strong shoes which fit closely around the ankles. Nose-guards made of rubber and shin-guards are often worn, but are not absolutely necessary.

Football is a very old and very widely played game. Several thousand years ago, we know, it was played by the Greeks. Through the Romans it was passed on to the Britons. The English gave it to America, where it has, in the last thirty-five years, developed into a game distinct from any played elsewhere.

The American Intercollegiate game, played by nearly all of the colleges and most of the schools, is played upon a rectangular field, 360 feet long and 160 feet wide, enclosed by white lines marked on the ground. Two lines, 300 feet apart, are called the goal lines. In the middle of each of these is erected a goal, consisting of two upright posts 20 feet high and 18½ feet apart, with a horizontal cross-bar 10 feet from the ground. Parallel with the goal lines, white lines run across the field 5 yards apart, and these lines give the field its familiar name of gridiron. These are the official dimensions. In games between teams of boys, however, the field is often smaller, depending on the space available; and the 5-yard lines, which are merely an aid to the referee in judging distance, are usually omitted.

The ball is an inflated rubber bladder, with a leather cover, usually made of pigskin. It is not round, but drawn out lengthwise into rounded points at opposite ends, to make it more easily handled. The game is played by two sides of eleven men each. Seven of these men are forwards, who form the rush line, and they take positions beside one another, facing the goal line to be attacked, as shown on the diagram. The man in the middle is called the centre. At each side of him stands a guard; outside of the guards come the tackles, and outside of these, the ends. The remaining four men compose the backfield. Of these, the quarter-back stands directly behind the centre; two half-backs take their positions at the sides of, and a little further back than the quarter. Still further to the rear, and behind the centre of the line, is the full-back's place. This is, in general, the arrangement of the men when in possession of the ball and lined-up for an attack. When on the defence, while the line-men keep their positions, the backs shift to meet different plays by their opponents, sometimes playing far to the rear in readiness to receive a kicked ball. Because they take so many different positions, we do not show the defence on the diagram.

The standard length of time of a game is sixty minutes of actual playing. This is divided into four periods called "quarters," of fifteen minutes each. Between the first and second quarters, as well as between the third and fourth, there is an intermission of one minute. The period of rest between the second and third quarters lasts fifteen minutes.

Scoring is accomplished in two ways: by touching the ball down behind the goal line, or by kicking it over the cross-bar of the goal. When a player succeeds in carrying the ball across the opposing team's goal line and there touches it to the ground, it is called a *touch-down*, and counts six points. When a team has made a touch-down, the ball is brought out into the playing-field, and one of the men of that side tries a *place-kick*, that is, kicks the ball from the ground where it is held in position by one of

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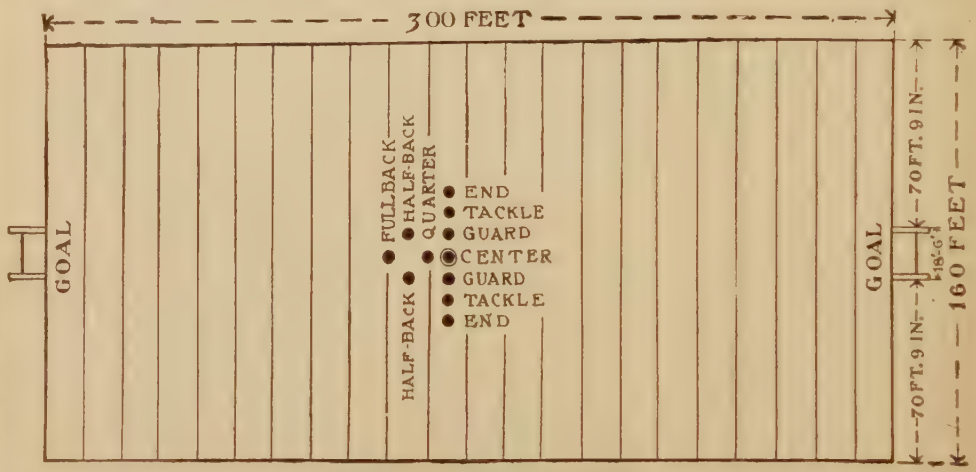
his team-mates. If the ball passes over the cross-bar, it is called a *goal from touch-down* and adds one point to the score. A *field-goal*, which counts three points, may be made without having scored a touch-down, by sending the ball from the playing-field, over the cross-bar, by means of either a place-kick or a *drop-kick*. A drop-kick consists in dropping the ball from the hands and kicking it just as it begins to rise from the ground. When any member of a team is forced to carry the ball behind his own goal line and there touch it down, his team is said to make a *safety*. This counts two points for its opponents. If, however, a team recovers, behind its own goal line, a ball kicked across *by the opposing side*, a safety is not counted. This is called a *touch-back;* it does not add to the score. After a touch-back, the defensive side has the privilege either of carrying the ball out to its own twenty-five yard line, and there putting it in play, or of kicking out to its opponents from any point within its own twenty-five yard line.

The two captains having decided the choice of goals and kick-off by tossing a coin, play begins with a kick-off from the kicker's forty-yard line. The players of this side line up even with the ball. One of their number, after a short run, kicks the ball into the territory of the enemy, who have scattered about their half of the field in readiness to receive the kick. The man who catches the ball starts on a run toward the hostile goal, protected as much as possible by his comrades, and striving to evade his opponents, who have come charging down the field as soon as the ball has been kicked. If the runner succeeds, by dodging, in making his way through the ranks of his opponents and crosses their goal line, he has scored a touch-down. Usually, however, he is tackled and thrown. When his course is thus arrested, the ball is said to be *down*. In that case, the ball is given, at that spot, into the charge of the *centre* of the runner's side. His team-mates line up at the sides of the centre on a line even with the ball and parallel with the goal line in the manner described before when speaking of the players. Opposite them, their antagonists line up. Both sides are now ready for a *scrimmage*. At the signal, the centre snaps the ball to the quarter-back, who passes it to the man in the back-field who has been called on to advance the ball by *rushing*. The rusher tries to carry the ball either through the line or around one of the ends. When he has been stopped, the ball is said to be *down* for the second time. Four such *downs* are allowed, in which to make a gain of ten yards. When ten yards have thus been gained, it is again called *first down*. Thus, the team continues its progress toward the enemy's goal, unless it either loses the ball on a fumble, or fails to gain the required ten yards in four tries. When a team perceives that it will not make the necessary ten yards in its four downs, the practice is not to rush the ball on the last down, but to kick it so as to place it as far away from their goal as possible. In either case, the ball comes into the possession of the other side, which now makes its attack in a similar way. A *forward-pass* may be made from scrimmage formation by any man in the back-field, and may be received by an *end*, or by any man who was in the back-field when the ball was put in play. Such a pass may be intercepted by any opponent.



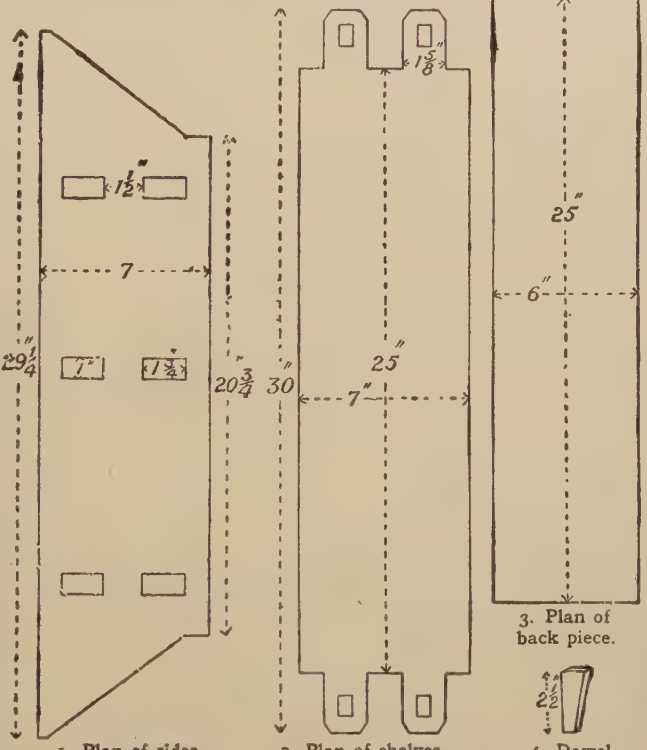
The Field Laid Out for Football.

Regarded as *fouls* and forbidden are: off-side play, that is, getting in front of the ball; holding or tackling any one but the man with the ball; tripping, striking, or kicking a man; "piling up" on a "downed" player. Boys who wish to play the game in earnest should get the book of rules and study them, and better still, get some person who knows the game to teach it to them. Football is hard to learn from a book.

MAKING A SET OF BOOKSHELVES

IN proceeding with our carpentry work, we must not try to advance too rapidly. We shall do better work if we make very simple things at first. Another point to keep in mind is the utility of the articles we set ourselves to make. Our work is likely to be more thorough if we know that it has to stand the test of perhaps daily use. Here we shall see how to make an exceedingly useful article—a set of hanging bookshelves—which we can attach to the wall.

Everyone needs an article of this kind, and everyone with ordinary intelligence and the necessary tools can make one. The sizes given in the sketches are good useful sizes, but the best sizes for the article to be made depend upon the space available for its accommodation. Many of us remember how the Vicar of Wakefield had his family's portrait painted, and then found the canvas so large that it had to stand against the kitchen wall. Thus everyone who makes the bookshelves from these sketches must first decide if these sizes are the best in his individual case, and if they are not he must modify the sizes given to suit his own case.



1. Plan of sides. 2. Plan of shelves. 3. Plan of back piece. 4. Dowel.

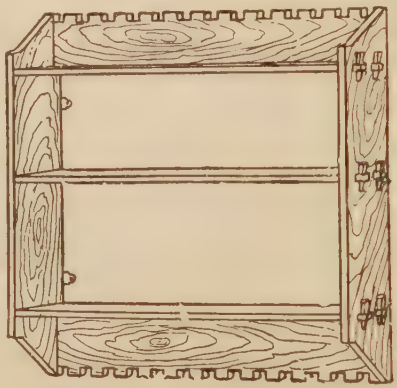
We have first to decide what kind of wood we shall use. We could use oak, beech, or birch—perhaps oak looks better than the other two for the purpose—but all these are hard woods, and it will be much easier for us to use a soft wood, such as pine. Hard woods are much more difficult to work. We can use soft wood, and after the shelves are made we can stain them to imitate any of the harder and more expensive woods.

In picture 1 we show one side of the hanging bookshelves with all the sizes marked on it. We first cut out two pieces of the wood we are using—pine, for instance—to this shape. They must be fairly strong, and we should make them so that the finished thickness shall be not less than one inch, so we had better use wood 1⅛ inch thick and reduce it to one inch by planing it. The holes in the sides we can make with a chisel, and we must be particularly careful that each pair of holes is exactly in the same horizontal line, so that the shelves may be quite flat. It is safer to make the holes a little small at first, for it is very simple to enlarge them if necessary. We must also see that the two sides are exactly alike. Having cut the two pieces, we must finish them carefully with the plane so as to have them true and smooth, afterwards rubbing them well with sand-paper, or glass-paper, these being two names for the same material. We should use No. 1 sand-paper first, rubbing the surface and edges carefully until they are as uniformly smooth as the sand-paper can make them, and then we use No. 0 sand-paper, which will give them the final touches. It is more important to have the sides smooth than it is to have the shelves smooth, because the former are more exposed to view.

Having made the sides, we turn our attention to the shelves, of which we shall make three. We shall make them all alike, and thereby simplify matters. Picture 2 shows the shape and the sizes which we should make them. The thickness of these pieces when finished should not be less than ¾ inch and preferably ⅞ inch, so that the wood, when we begin, should be thicker than this, to allow us to have this thickness when the planing and sand-papering are finished. Having made the shelves, we fit them into the sides so that the ends go through the holes we made in the sides, and if they do not quite fit we must make them fit. We shall want twelve taper pins, or *dowels*, for the holes in the ends of the shelves to cause them to retain their position in the sides, and these pins we can easily make. It will be much better if they are of hard wood—oak, beech, birch mahogany, or walnut, for instance—even if the sides and shelves are of soft wood. There is more strain upon the dowels than upon the other parts, and as they are smaller, strength is necessary. The shape and size of dowel necessary are given in picture 4.

The shelves would do as they now are,

but would be liable to twist unless we strengthened them, and we shall do this by two back pieces, one above the top shelf and another below the bottom shelf. Picture 3 shows the sizes for these pieces, both of which are alike. Having cut them out and finished them, we nail them on, one above the top shelf and one under the bottom shelf. The set of shelves is now complete as far as carpentry goes. If we buy at the hardware merchants' 4 mirror plates, we can attach the shelves to the wall by their means. We must attach these mirror plates to the sides and not to the shelves. We put two at each side, as seen in picture 5. These would do well enough if they were put on to stick outwards, but in that case they would be seen when the shelves are attached to the wall. By putting them on as indicated in picture 5, the books will hide them and the shelves will look much better when they are fixed in the place they are to occupy.



5. The completed bookshelves.

If we have used pine or other soft wood, we can stain the shelves any color we prefer, and can imitate mahogany, rosewood, walnut, or ebony. We purchase any of these stains in either small or large bottles, and apply it with a brush. Then we can put on some French polish if we wish to give the article an extra fine finish and can afford the modest expense. There are several other ways in which we can ornament the bookshelves. We may, if we like, make the top and bottom pieces "embattled" or "dentilated,' as it is called, by cutting out pieces and leaving teeth-like projectors as shown in picture 5. We can carve the sides, or we can stain them with a pattern, using stencils, or we can burn some ornamentation, using a hot iron, or, finally, we can, if we wish, put some ornamental or imitation leather shelf-edging along the front of the shelves. Whether we decide to decorate in any of these ways or not, we shall have an article of wall furniture which we shall find very convenient, and of which we shall feel very proud, because we have made it ourselves, but it will considerably add to its appearance if it is decorated with some simple design.

THE MYSTERIOUS CHINESE BAT

THIS is a miniature cricket-bat, 6 in. long, as illustrated in the picture. In a row down its centre, about half an inch apart, are three small holes, visible on each side, and bored, apparently, right through it. But things are not always what they seem, especially in conjuring. A comparison of picture 1, representing a front view, and picture 2, representing a back view of the bat, will show how, in this case, the reality differs from the appearance. Of the three holes, A, B, and C, shown in the front view, only B and C are genuine, so to speak, A being a mere make-believe, going only half-way through the wood. On the other side of the bat, in a line with B and C, but half an inch nearer the lower end, is another dummy hole, D.

With the bat is used a little peg of wood, bone, or ivory, in length about three times the thickness of the bat, and just fitting comfortably into either of the holes B and C.

To show the trick, we, in the first place, call attention to the bat, asking the company to notice that there are three holes through it, as appears to be the case. We likewise exhibit the peg, which we may introduce with the remark that some of the company have no doubt seen the curious "jumping beans" which have been such a puzzle to naturalists, and that this little peg is a "jumping peg." Whether the motive power is the same in both cases you must leave the audience to decide.

1. Front view. 2. Back view.
The mysterious bat.

We may here remark that whenever a conjurer can introduce in his "talkee-talkee" of a trick some little scientific fact having a resemblance, however remote, to the effect he is about to produce, he should not fail to do so. If we can start people on a wrong scent, they are all the less likely to hit upon the true one.

But to return to our jumping peg. The performer puts it, from the front, into the hole B in such a manner that it shall project equally on each side. Holding the bat upright, he asks everybody to take notice that he has put it in the centre hole. He then lowers the bat as if to show the opposite face of it, but, as he does so, gives the handle a half-turn between his fingers. The effect of this is that *the same side* is still visible.

"Now," he says, "I shall command the peg to jump out of the middle hole and into the top hole." Under cover of a wave of the arm, he gives the bat another half-turn, thereby bringing the reverse side into view. On this side B is the *top* hole; and the peg appears to have jumped accordingly.

"Once more," he says, "we will place the peg in the middle hole." He then transfers it to C, which on the side now visible is the middle hole. Again he shows, apparently, both sides of the bat then commands the peg to jump, and makes the final half-turn as before, when the peg is seen to have jumped into the lowermost hole.

HOW TO MARK YOUR NAME ON FRUIT

IF we have apple, pear, or plum trees in our garden or orchard, it is quite easy to have our monogram, or any design we fancy, marked boldly upon the ripe fruit, without the assistance of ink, pencil, or any other similar material. The printing of the design is really done by the sun, and the method to be followed is quite simple. Cut out in paper, or thin metal foil such as chocolate is packed in, the monogram, crest, or other design that it is proposed to print upon the fruit, and then, while the fruit on the tree is still green, we stick the paper design upon it with white of egg or a thin paste. The design must be fastened upon the side of the fruit that is exposed to the sun, and when the fruit is full-size, though green. As the sun ripens the fruit, the part still exposed will become red, but the remainder covered by the paper will remain pale green or yellow, and when at last the fruit is picked the monogram or other design will stand out clearly and distinctly, and look very effective. In addition to apples, other fruits such as pears, damsons, plums, and peaches may also be treated in this way.

APPLE WITH MONOGRAM

If the weather is very wet, the paper designs are liable to get washed off the fruit, so that it is wise to have several papers of the same design in order that a washed-off monogram may be replaced by another exactly like it. To avoid this washing away by the rain, the paper design may be varnished, when the water will run off it; and it is not a bad idea to fix over the fruit a little wooden cap or umbrella to protect it from the rain. This, however, must not keep off the sun, or the fruit will not be properly colored, and consequently the monogram will not show up well.

By following this system we may cause great surprise to our friends, for, if we are giving a tea-party, and know sufficiently long in advance, it is possible for us to provide fruit bearing the initials of the different guests; and, unless they are in the secret, they will wonder greatly how we have managed to accomplish this. A large fruit-grower, who supplies table-fruit to one of the most fashionable restaurants in New York, always brands the fruit in this way with the monogram of the hotel.

FLASHING MESSAGES AT NIGHT

ANYBODY can make a little instrument by which he can flash messages to his friends at night across considerable distances. The idea of the instrument is something like that of the heliograph which soldiers use for sending messages to one another in daylight. The word heliograph really means to write by the sun, and the instrument consists of a little looking-glass that can be twisted about on a stand so as to catch the sunlight, and make flashes that are seen at a distant point. In the Boer War the heliograph formed the sole means of communication between the besieged British garrison and the relief columns.

The instrument we are going to make is very simple. First of all we obtain from the grocer a wooden box about a foot high by nine inches wide, and nine inches deep; the box should have a hinged lid. Inside this we are going to place a lamp, so we bore in the top a few holes, half an inch in diameter, to allow the fumes or smoke to escape. Then in the bottom of the box, which will be the front when it is stood up on end for use, we make a round hole one inch in diameter. Now on the inside of the lid of the box we hang a reflector of some kind to strengthen the light.

We also want a shutter on the front of the box that can be used to open and close the round hole through which we shall flash our messages. The best thing for the shutter is a piece of sheet tin, zinc, or thin wood. It should be about eight inches long, and two and a half inches wide at the end covering the hole, tapering down to about an inch at the end which will serve as handle. A hole must be punched near the middle, and it is fixed in position with a screw, so that it will cover the round hole in the box. The cover must work quite easily and smoothly on the screw.

Inside the box we place a lighted candle or small lamp, and our instrument is then ready for use. Where a house is lighted by electricity, we can take a lamp on a long wire and put it into the box. Any code of signals can be arranged between two friends, but the most sensible thing to use is the Morse alphabet, giving a short flash for a dot and a long flash for a dash. To make the flashes we hold the shutter by the handle, and work it up and down over the round hole. A little practice will soon make this quite easy.

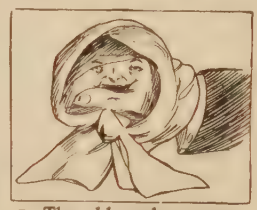
Our friend, if he wishes to carry on a conversation with us over a distance, must have a similar instrument. With two flash-boxes it is possible for two friends to talk at night a distance of half a mile.

We begin by placing the boxes each in a window facing the window of the other, and a few rapid flashes indicate that we are going to begin the conversation. When a boy knows the Morse alphabet, which can be found in our book, it is astonishing how quickly, with a little practice, he can flash out messages and read the replies.

If a boy is confined to his room recovering from sickness, yet not well enough to be out, or if he is quarantined because some one in the family has a contagious disease of some sort, a flash-box can be the source of much pleasure as by it the prisoner can talk to his friends, almost as easily as if they were actually present. A moment's thought will bring up many other uses for this box, which will be a never-ending source of amusement.

A SIMPLE ENTERTAINMENT FOR A PARTY

WE can cause a great deal of fun and amusement, and keep a party entertained for quite a long time, by skilfully using our hand to give the movements of a face or of a man in action. First of all, we can, with one hand, give a representation of an old apple-woman; and picture 1 shows how this is done. The position in which the hand is held is as follows. The fist is clenched, with the knuckles uppermost, but the thumb, instead of being held tightly round the fingers, is drawn back a little, as in the picture, and the forefinger is slightly loosened to make a mouth.



1. The old apple-woman.

We must, before closing the fist in this way, paint two eyes on the hand, one just about where the join of the first and second fingers comes, and the other in about the same position on the other side of the knuckles. Then we paint a nose on the knuckle of the first finger and lips at the opening made by the finger and the thumb. To add to the illusion we put a piece of red rag or an old shawl round the made-up face, and the appearance is then as in picture 1, and is quite realistic and very amusing.

By moving the thumb up and down, the mouth seems to open as if the old lady were talking; and if we make up a story as we are moving the mouth, or, better, answer in a humorous way questions asked by the audience, the delight of the spectators will be evident. The first joint of the thumb makes a very life-like chin. By moving the thumb low down and making the mouth very wide open, the old lady seems to be gaping and it is amusing to see how, by doing this, we can make many people who are watching our hand also gape.

The old apple-woman is only one of many suggestions. We can make up many other disguises for ourselves, as the painted features need vary but very little. A piece of fine lawn, and we have a nun, a little scrap of frilling, and behold we have a little baby. Another amusing performance with the hand is that of the dancing Highlander. We draw a picture of the upper part of a Highlander as far as the waist. Then we fasten to the bottom of this a piece of any cloth material — plaid for preference. Now let us take an old glove, and, after cutting off the two first fingers of it, put the glove on. Our first and second fingers will, of course, come through the holes, and be bare. Next cut off the tips of the fingers that were previously cut from the glove, and put these on the two bare fingers, to look like shoes. Now if the body of the Highlander in cardboard, with the kilt attached, be joined in some way to the glove, by sticking or stitching, we shall get what is a very realistic appearance of a Highlander, with his kilt, bare knees, and shoes. By moving our fingers about on a table, as shown in picture 2, we can make the Highlander dance; and the effect is heightened by putting down on the table two crossed matches, to represent crossed swords.

2. The dancing Highlander.

A third way of using the hand for the entertainment of our friends is to represent a clown or magician or Chinaman, as shown in picture 3. We take any head of a quaint doll that may be available. The heads of those cheap Japanese dolls that are sold in the shops are very suitable. To this we glue, or stick in some other way, a bag of colored calico or rag. The bag should be inverted so that the opening is below, and the head is on what would be the bottom of the bag if it were held in the usual position for putting things into. The bag should have made in it two long pockets, like the fingers of gloves, only longer. Now we are ready to give our entertainment. Holding our hand as in picture 3, we put over it the bag with the head, slipping our forefinger into the opening of the head, our thumb into one of the pockets of the bag, and our second finger into the other. Then we move the thumb and two fingers about, talking at the same time and suiting the actions to the words. With a little skill we can make the figure do the most ridiculous things. With his hand he can pick up a stick, like Punch does in the Punch-and-Judy show.

3 How the hand is held to work the moving doll.

THE STONE IN THE ROAD

CONTINUED FROM 6196

THERE once lived a king who ruled his subjects so wisely and so well that his fame spread near and far.

But everything was left by the people for someone else to do, and at last the king decided to teach them a lesson.

Now, it happened that one of the roads that led to the town passed through a hill. To this spot the king went late one night, and scooped a hollow right in the middle of the cart-tracks. Then from the folds of his cloak he took a small bundle, and placed it in the hole. Going to the side of the road, he loosened a large stone, which he rolled to the hole he had made in the road. There he placed it, so that it completely covered the opening.

Next morning a farmer driving his cart came that way.

"Ah," he cried, "the laziness of those people is terrible! Here is this big stone right in the middle of the road. I dare say it has lain there long enough for someone to have moved it. But no! everyone is too lazy to attend to such a simple matter." So saying, he pulled his horses to one side till his cart grazed against the side of the hill, and so passed on.

Presently down the road came a soldier. He sang gaily as he marched along; but his head was too far back for him to notice the stone, and in a moment he was sprawling in the roadway. He picked himself up, grumbling at people's carelessness, and walked on. But he left the stone where he found it.

Later some merchants, with pack horses heavily laden, passed that way.

"This is a fine country!" said one. "I wonder how long that big stone has been lying there." But not one of them thought it worth while to move it out of the way, but the company divided and passed to right and left of it.

Thus it went on day after day, and no one even attempted to move the stone, though everyone blamed his neighbor for letting it lie. When three weeks had passed, and it still lay in the road, the king sent word to his people to meet him at this very spot.

"My good people and faithful subjects," he said, "it was I who put this stone here; and for three weeks everyone who has passed has blamed his neighbor for not moving it."

Then he lifted the stone, and showed them the hollow place beneath, in which lay a small bag labeled: "For him who lifts the stone."

He undid the string and a stream of golden coins fell out. After that no man in that country left the immediate task for his neighbor to perform.

THE WONDERFUL FRIENDS

A SHEPHERD lad was once sent by his father to carry food to his elder brothers, who were in the army of the king, encamped before a powerful enemy. When the young boy arrived, he found everywhere dismay and anxiety. For the champion of the other side had challenged any of their host to combat, and so mighty was he that none had dared to answer.

"Who is this man," inquired the shepherd lad, "that he should defy the armies of the living God?" He offered to go himself, and was brought before the king, and the king, after speaking to him, had him dressed in his own armor. But the lad said, "I cannot go with these, for I have not proved them." And he put them by. Then he took his shepherd's staff and his sling, gathered some smooth stones from the brook, and went out to meet the champion.

When Goliath, the mighty warrior, saw him, he was enraged, and cursed him in contempt. But the young patriot replied, "You come to me with a sword and a spear and a shield; but I come to you in the name of the Lord of hosts, the God of the armies of Israel, whom you have defied. This day will the Lord deliver you into my hand." And as the warrior bore down upon him he fitted a stone to his sling, and, whirling it about his head, let fly; and the stone struck Goliath on the forehead, and he stumbled and fell upon his face to the earth. Then the lad snatched the fallen hero's sword, and smote off his head. When the Philistines saw their champion was dead, they fled. But among the Israelites in an instant despair had changed to confidence and enthusiasm.

With a shout of joy, the army of Israel arose, and, flinging itself upon the enemy, drove them away in utter confusion.

Then the King of Israel inquired about the shepherd boy, but none could tell his name. "Inquire whose son the stripling is," he said; and presently the boy was brought before him, with the head of the giant in his hand, to answer for himself. "I am the son of thy servant Jesse the Bethlehemite."

Beside the king was his son, and this gracious young man, regarding the shepherd boy as he spoke to his royal father, felt his soul suddenly knit with the handsome lad's, and there and then loved him as his own heart. So he spoke to the king, and the king said that the lad David should no more return to his father's home, but should live with him in his palace, and be a soldier instead of a shepherd. And the king's son, Jonathan, took off his royal robe, and put it upon David, and gave him his sword, his bow, and his girdle. And he held David's hand, and looked in his eyes, and they made a vow together of a friendship which should last till death.

Life had changed utterly and completely for David in an instant. From living in a humble cot, he went to live in a king's palace. From being a shepherd of the hills, he was a captain of soldiers.

What dreams of glory must have crowded the lad's brain! It seemed as if there was no height to which he might not soar, no fame he might not earn, no happiness he might not now enjoy.

In all the glory and honor which now invested him, there was one thing far more gracious and more glorious than all the rest, and this was the deep love of the king's son. Clothed in such a love, as with a kingly robe, the young David was something more than warrior and hero.

What Julius Cæsar was to the Romans, what Napoleon was to the French army, this and more was David to the hosts of Israel. The spell of the man's *soul* was over the people, and in him they beheld a captain from heaven, whose right hand was terrible with victory. So, wherever David went with the army, triumph followed, and, on the return of the soldiers, the streets were loud with his name and with music to his honor.

In this glory of young David, Jonathan rejoiced with all his noble and generous nature.

But the people shouted, "Saul has slain his thousands, and David his ten thousands!" And this cry pierced the king's chamber, and struck on his soul like the voice of Destiny. From that day Saul regarded David with growing jealousy.

Slowly it came to the mind of the king that David was his enemy. At first he

had been envious of the praise showered upon his favorite; then he became suspicious. He regarded him as plotting for the throne of Israel.

He spoke about this idea to Jonatnan and his courtiers, saying that David was dangerous to the royal house. But

But, in a war that soon followed, David was again so successful that the king's suspicions returned, and, with his own hand, on a sudden impulse of hatred, as he sat with his successful captain, most basely the king sought to kill him with a javelin. Then David fled away from

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THE STONE FROM DAVID'S SLING STRUCK FULL IN THE GIANT'S FOREHEAD

Jonathan, after he had warned David to lie in secret for a little space, went to the king and spoke so convincingly of David's honor and of his service to the nation that the king put away his suspicion, and said, "As the Lord liveth, he shall not be slain." So David returned to the court and lived as before.

the court that night back to his own house.

Jonathan came to him in secret, and the two friends comforted each other. Then Jonathan returned to soften the king's wrath against David. But when he spoke to Saul, the king this time burst out upon him with violent rage, bidding

him see that he would never succeed to the throne while David lived; and admonishing him to throw aside a treacherous friend, and to try and protect his own interests while there was still time.

To all this Jonathan replied, "Why should he be killed? What has he done?" And this gentle answer so enraged the king that he hurled his javelin even at Jonathan.

Then Jonathan saw that it was in vain to plead, and unsafe for David to be within reach of his father's arm. So he approached David in secret, by a signal agreed upon by them beforehand, namely that Jonathan would shoot three arrows as if at a mark. If he said to his attendant, "The arrows are beyond thee," it would mean that his news was bad. Then David fell upon his knees, bowed his head to the ground, and waited for Jonathan.

Jonathan came near, took David into his arms, and they kissed one another, and wept together, till David was unmanned, and broke into tears.

Then Jonathan comforted the mighty conqueror, valuing his friendship more than life. "Go in peace," said he; "go in peace, because we have vowed, both of us."

Many years afterwards, when David, having gone through a multitude of adventures, was become a king himself, he heard how Saul and Jonathan had died together in battle. The news broke him down, and he cried out, "The beauty of Israel is slain!" and he forgot his own wrongs that he had suffered at the hands of Saul and said, "Saul and Jonathan were lovely and pleasant in their lives, and in their death they were not divided." Then the old friendship with Jonathan, with all its fragrance of innocence and youth, returned to him, and he mourned for his friend, "I am distressed for thee, my brother Jonathan. Very pleasant hast thou been unto me. Thy love to me was wonderful!"

The king's son felt his soul suddenly knit with the soul of the handsome lad.

THE GREY TERROR

THE FIRST BOY WHO PLAYED WITH A DOG

AFTER Swar's adventure with the lioness, the men and women in the camp were very watchful over the son of their chieftain. He was never allowed to go out alone beyond the camp where Cornhill now is. It was not till the Grey Terror arrived that he had any more exciting adventures.

"Game is getting wonderfully abundant," said Wawa, one morning, late in autumn, to his wife Bina.

Only a few minutes before he had gone out hunting, and he had returned loaded with spoil. The river swamp was crowded with wild sheep and elk and horses and oxen and deer. That day the tribe got enough meat to last them till the winter months. Everybody was wild with joy, except Wawa.

"Something terrible must be happening on the south side of the river," he said that evening, as the tribe was eating round the great fire on the top of the hill. "I went down to the ford. For a quarter of a mile the river is black with animals swimming madly across to the northern wilderness. They are all going toward the north, and the tribe will have to go with them or starve."

"Why?" cried all the men.

"I do not know why," said Wawa; "but I will soon find out."

He took his heaviest stone axe and his best stone dagger, and tied them round his waist. He then stripped himself of all his skins, and dived into the river, and struck out for the southern shore. None of the men and women of the tribe slept that night.

When morning came, there was no need for them to go out hunting. Herds of terror-stricken beasts came charging up the hill and sweeping through the camp, overturning the skin tents and scattering the tribe. Everything was in confusion when Wawa came limping up from the river. His stone axe and dagger were gone, and he was wounded in the leg.

"Don't trouble about the tents!" he shouted. "The Grey Terror is coming, and there is no time to escape! Out in the jungle for your lives, and get wood to make a great fire round the camp! Out, I say! Out, all of you—men, women and children—and collect brushwood!"

No one had ever seen Wawa look so terrible as he did then. No one dared to wait and question him. All the tribe rushed into the jungle, the children following their mothers, as Swar followed Bina. They helped to tear down the brushwood, while the men hammered with their stone axes at the smaller trees, or lighted fires at the roots in order to burn through the trunks. And the piles of brushwood grew higher in the circle around the camp, but Wawa would not let them stop. "More," he said, "more. We shall need every stick in the jungle."

At this awful moment Swar took it into his funny little red mop of a head to trot away into the swamp and see what was the matter with everything. Bina, of course, missed him, but thought he was with his father; while Wawa, who was limping round the camping-place and studying where to make the circle of fires, naturally fancied that his son was busy with his wife collecting wood.

All the jungle swamp was now empty of large animals. They had fled into the northern wilderness. Swar took the track toward what is now Hampstead, which he had followed on his first voyage of exploration. There was no sound to be heard save that the grey monkeys chattered in the tall forest trees as he passed by, and great long-legged storks, searching for frogs in the pond, slowly flew away at his approach.

"I don't know what I shall hunt today," said Swar to a monkey that was peering curiously at him from the lowest branch of a fig-tree. "Could you tell me where I could find the Grey Terror that daddy spoke of? I must kill it, because it is frightening mummy, and then I will wear its skin when my lion robe is torn."

Swar thought that the monkey would understand him. It looked such a quaint human creature, as it peeped down at him, that he was sure it was some strange sort of child. By a stroke of wonderful luck, the monkey that morning happened to be in a mischievous mood. Plucking a large juicy fig, it threw the fruit at Swar, and struck

SWAR FOLLOWED THE MONKEY FROM TREE TO TREE

him plop! on the face. In the twinkling of an eye Swar had made up his mind. This grey, ugly thing which threw figs at you when you asked it a question was surely the Grey Terror itself, he thought.

He was up the tree in a minute. No man or boy of modern times could climb with the agility that this primitive little savage displayed. He was almost equal to the monkey at its own game. He followed it from tree to tree, never touching the ground once, but swinging from branch to branch, like a little human ape. Sometimes he stopped to breathe and nestled in the forking branches of a tree, and made a meal on nuts and figs. And there, in the tree beyond him, squatted the monkey, imitating his movements, and feeding on what he fed on. It made Swar angry and he kept chasing the animal till nightfall. By that time he was so tired out that he fell asleep over his last meal, and the monkey came and squatted beside him, high in a branching oak-tree, and put its hairy arms gently round the sleeping boy.

All that night there was a strange noise in the silent forest. Pitter-patter, pitter-patter it went on the leaf-strewn ground. Now and then the shriek of a rabbit was heard. And once, as the autumn moon shone for a moment the light from it fell on a vast, grey, moving mass, which was silently sweeping through the forest. A thousand glittering eyes instantly looked up, and the strange stillness of the jungle was suddenly broken by a loud, wailing cry from a thousand red throats. Then the clouds came together, and silence and darkness again fell on the forest, and the pitter-patter, pitter-patter noise gradually died away.

Swar was very angry when he awoke in the cold dawn, and found the monkey's arm around him. He did not think what it was that had kept him warm all night and he had forgotten all about the Grey Terror. But he felt hungry and lonely, and he wanted to get back to his father and mother.

"I don't want to play with you," he said, as his strange bed-fellow began to gambol about the tree and chatter to him. "I'm going back to the camp."

He climbed down from the oak-tree, and set out to find the camp by the river. As you can guess, he was a good distance away from his home. Happily, his father had taught him how to guide himself by the position of the sun, and

after a tramp of four miles he came to the shore of the Thames at the place where Chiswick now is.

"Now I know my way home!" he said joyfully.

And, turning right to the east, he trotted along the river-bank towards Westminster. Of course, there was no path along the river in those distant days. The land was covered with a dead undergrowth, broken here and there by irregular tracks made by the woolly elephants and the huge buffaloes as they went down in herds to the water to drink. At Westminster, where the Thames was shallow, all the jungle for about half a mile had been trampled down flat by the huge droves of terror-stricken beasts that had fled before the Grey Terror into the northern wilderness.

As Swar was passing over this strange place, a little animal came out of a muddy tuft of reeds, and began to follow him. Swar did not notice it until it licked his bare legs, and made him turn round with a start. He had no weapon, and he gave a cry of fear, and ran away as fast as he could. The little animal easily overtook him. Instead, however, of trying to hurt him in any way, it ran by his side, and attempted to play with him. Swar at last stopped—it was no good being frightened—and looked at him in a friendly way.

"You're a funny little thing," he said. "You're like a young wolf-cub, but your grey fur is finer and softer, and you're not a bit fierce."

It was, indeed, only a frolicsome little puppy-dog. Swar found it a delightful playmate. They chased one another in turn from Westminster to Cornhill. Panting from the exercise, and wild with delight over his new pet, Swar at last rushed up to the camping-place of the tribe, and shouted and capered outside the circle of burning wood.

"Joy, joy, joy!" cried Wawa. "Swar is safe! The Grey Terror has not eaten my son. Beat down the fire, men, and let him in!"

Men, women, and children hastily caught up whatever was handy—skins, sticks, and stone spears—and raked some of the burning wood away to make an entrance for the little boy. Bina and Wawa rushed forward to embrace him, but the little puppy-dog got through first, and rushed towards them, barking loudly out of sheer excitement.

"The Grey Terror—the Grey Terror! It is upon us! The river! Jump into the river! It is our one and only chance! Oh—oh—oh!" shouted all the tribe loudly, in a madness of fear.

THE LITTLE ANIMAL TRIED TO PLAY WITH SWAR

They leaped through the line of fire at the water-edge, in a wild, confused, and swift movement. Only Wawa remained behind. Lifting up his great stone axe, he sprang to the opening made in the fire circle, shouting :

" Run with your mother, Swar ! There is still time. I will keep the Grey Terror back while my life lasts ! "

Swar took his little puppy up in both arms, and began to run to the water as fast as his little legs would carry him.

" Kill it, boy ! Kill it ! " Wawa shouted to his son. " That is one of the Grey Terrors you are carrying ! "

Swar stopped running in blank surprise, and looked first at his father, and then at the puppy. The little dog began to lick his face. In the meantime, Wawa had turned, and he was now gazing, open-mouthed with astonishment, at the empty jungle stretching from Cornhill to Walbrook. He had expected to see a vast, grey, surging mass of fierce beasts charging up the hill, their hungry jaws open to devour the tribe.

" This is one of them—a very little one," he said at last, going up to Swar, who, very puzzled, was sitting on the ground, clutching the puppy as tightly as he could. " But the great herd of the Grey Terror seems to have swept northward on the trail of the forest cattle. The tribe is saved then. Where did you find this little beast, my son ? Wow-wow-wow ! How playful and friendly the little Terror is ! "

Wawa patted the puppy, and it licked his hand, while Swar was telling his father his adventures with the monkey, and his finding the dog.

" It was well for you, my son," said Wawa gravely, " that you slept last night high in an oak-tree with your mocking playmate's hairy arms around you. The Grey Terror came sweeping up to our camp early in the evening, and even with a double line of fires we had trouble in beating them off.

" They must have passed you in the darkness when they turned north. Yes," he added, as Swar looked up to him with imploring eyes, " you can keep your little grey beast as a playmate if you like. At least, unless he grows fierce and dangerous."

And that was how Swar came to be the first human being who had a faithful dog to help him when he went out hunting.

WHY THE SWALLOW BUILDS ON THE WALL

IN the days of long ago, when the first swallow skimmed lightly over moor and meadow, she was very proud of her pretty plumage and her long, forked tail. She flew low upon the water that she might see her own reflection upon its clear surface and at last, so occupied, became so vain that she could think of nothing but how best to show herself off before all her feathered friends. So it came about that in time she quite forgot how to build a nest.

After trying in vain for a time, she decided to ask help from some of the other birds. She went to the thrush, for she thought she looked the most good-natured, and asked her help.

" I will show you gladly," said the thrush. " First, you take some of these old grass stalks."

" Yes," said the swallow.

" Then take a lump of clay," went on the thrush, " to plaster them."

" Oh, yes, I know ! " broke in the swallow.

" Plaster them exactly like this."

" Yes, I can do that all right."

" Then you turn it up like this."

" Oh, yes, I know ! " again said the swallow.

" And then you——"

But before the thrush could add another word the swallow interrupted again.

" I know," she said ; " of course."

This made the thrush angry.

" Well," she said, " if you know so much, why do you come bothering me with your questions ? "

So saying, she flew away to look after her own nest and eggs.

Only half round the nest had been built, and the swallow, thus left to herself, could not make out how to finish it. She tried again and again, but all in vain. So she stuck the side she knew how to build on a wall, and made it do.

And thus it happens that the swallow, through thinking she knew more than she actually did know, has only half a nest to this day, as you can easily see.

THE ROBBER AND THE MONK

A MONK who belonged to one of the monasteries near Paris used to travel from village to village in the neighborhood collecting money for the support of the monastery. One day, when he was returning home through a wood, a robber suddenly stepped in his path, and, presenting a pistol, demanded that the bag of money should be handed over.

The monk was of course unarmed and he at once saw that he would lose his life if he resisted, so he gave the robber the bag, asking only one favor in return.

"What is that?" said the man. "I never grant favors in the dark."

"Well," replied the monk, "when I get back to the monastery, I don't want my brethren to think I tamely gave up the bag of money without making a fight, so I am going to hold out my cloak, and I want you to fire a bullet through it. Then it will be clear to my brethren that my life was really in peril."

The robber fired, but the monk could see no hole made by the bullet, and expressed astonishment.

"Ah!" laughed the robber. "That is not surprising, for I will tell you in confidence that I never load my pistols with bullets; I simply fire off gunpowder, and that is sufficient to make any traveler give up his money."

"Really!" answered the monk; and with that he sprang suddenly upon the robber, overcame him and bound him, and so recovered his money. Then he deprived the robber of his pistol, that he might not terrify any other travelers, and for the purpose of convincing the other monks of the perils of his journey.

THE MAN WHO BROKE THE NEWS

THE son of a country landowner went to Paris to study at the University, and, after he had been there some time, he was astonished one morning to see an old manservant from his father's house.

"Why, what is the matter?" said the young man.

"The cat is dead," was the reply.

"The cat dead! Why, what did the poor animal die of?"

"Of indigestion, through having eaten too much meat."

"Too much meat! Where did the meat come from?"

"From your poor horses."

"The horses! Are they also dead, then?"

"Yes, the poor animals died from exhaustion, through having to carry so much water."

"What was the water for?"

"To put out the fire at the house."

"The fire at our house?"

"Yes, it caught fire because the maidservant forgot to put out the candles."

"What candles do you mean?"

"Why, the candles used at your father's funeral."

"My father's funeral! Do you mean to say my father is dead? Why did you not tell me at once?"

"Well, I was told to be sure to break the news to you as gently as possible."

THE PAIR OF NEW BOOTS

A FRENCH soldier who was serving with his regiment in Algeria wrote home to his old father asking that a new pair of boots might be sent to him.

The father went to the village shoemaker's and bought a pair of strong boots, and then asked one of his acquaintances how to send them.

"You can telegraph them," said he.

"But that will cost a great deal of money," replied the old man.

"Oh, no," said the other, "it will cost you nothing. All you have to do is to take them out into the open country and hang them on the telegraph wire."

The old man decided to follow the advice, but hardly had he departed when a beggar, who had noticed the performance, went quietly, and, taking down the new boots, hung up his old and ragged ones in their place.

The father, feeling curious as to whether the boots had gone, went out of the village to see.

"Bless my soul," said he, "this telegraph is a wonderful thing. Here, for nothing, have I been able to send a pair of boots all the way to Algeria, while my son has been able in very little time to send his old ones back again to me."

STORIES TOLD IN INDIA 3,000 YEARS AGO

THE BLUE JACKAL

A JACKAL, prowling round a town one night, fell into an indigo-tank, and came out dyed blue.

"No one will know me now that I am this splendid color," said he, "so I will pretend that I am king of all the beasts."

He began by ruling over the jackals, and then the lions and the tigers submitted to him. This made him proud and insolent, and he no longer took any notice of his old jackal friends.

One night they gathered round the self-made king and began to howl, and as soon as the blue jackal heard the others yelling, his natural instinct led him to do the same, and at once all the other creatures in the jungle knew him to be nothing better than a jackal, and he lost for ever his crown.

Silence is sometimes golden.

THE TRAVELER AND THE HERON

A WEARY traveler lay down to rest under the shadow of a fig-tree and went to sleep. In the tree lived a crow and a heron, and the heron had often been warned he would come to a bad end if he kept company with an evil crow.

As the sun shifted, so the shadow of the tree moved away from the traveler, and he was left exposed to the sun. But the heron, seeing this, felt sorry for him, and spread out his wings and shaded the weary traveler. The evil crow, however, laughed at the heron, and then, to annoy the traveler, dropped a stone upon his face and flew away.

When the traveler, smarting from the sting of the stone, jumped up and seized his bow and arrow, he saw only the heron in the tree above, and, thinking that this was the culprit who had thrown the stone, he fitted an arrow to the string, and fired and killed the heron.

Avoid evil companions or they may lead you into serious trouble.

THE CROWS AND THE ANKLET

A PAIR of crows lived in a hollow tree, and there also lived in the bottom of this tree a fierce snake that used to eat the young of the crows as soon as they were hatched.

One day when the son of the king came down to the river close by to bathe, the male crow flew down, and, seizing a golden anklet that the prince had removed and laid on the bank, he flew away with it and dropped it inside the hollow tree.

Of course, as soon as the king's son came to the bank again after bathing to put on his clothes, he noticed the anklet was missing. There was a great hue and cry, and every place was searched for the missing jewelry. At last the anklet was found in the hollow tree, and the serpent was also found by the prince's attendants, who instantly killed it.

Skill will make up for lack of strength.

THE ELEPHANTS AND THE MOON

IN a time of drought a number of elephants had difficulty in finding water for themselves. But at last they discovered a pool, near which lived a colony of hares, and in going to and fro the elephants used to trample upon several hares every day. At last the matter became so serious that a meeting of the hares was held, and, after a good deal of discussion, an old hare, known for his wisdom, undertook to make the elephants cease using the pool.

Standing erect upon a hillock, as the sun went down, the little old grey hare listened for the crashing in the jungle which would tell him that the great beasts were coming down for their evening drink. When the sound reached his ear he stiffened his thin form, though his heart beat violently, and as the leader of the elephants approached, the hare said:

"Sir, I am an ambassador from the moon, who wishes you to know that this is his pool, and that the hares whom you are driving away are its guardians."

"We know nothing of this," said the elephant.

"Well, if you come here to-night, you will see the moon in the pool, shaking with rage."

The elephant went. He saw the reflection of the moon, which quaked as the water rippled, and in great fear he promised that the elephants should trespass on the pool no more.

Superstition often causes those who are mighty to tremble.

CONTINUED ON PAGE 6339.

The beautiful harbor of St. John's, the capital of Newfoundland.

THE DOMINION OF NEWFOUNDLAND
WHERE THE CODFISH REIGNS

CONTINUED FROM 6126

NEWFOUNDLAND, the first born English colony in America, is an island at the mouth of the Gulf of St. Lawrence, which it protects from the full sweep of the Atlantic Ocean. It is not part of Canada, but as it is part of the British Empire, and lies so close to Canada, we tell its story here. The island, roughly triangular in shape, with its area of 42,734 square miles, is one-third larger than Ireland. The coasts are everywhere bold and rugged, presenting a high line of broken cliffs, indented with numerous bays and studded with countless islands.

THE BEOTHUKS, THE EARLIEST INHABITANTS OF NEWFOUNDLAND

The earliest known inhabitants were the Beothuks, a numerous and powerful race, who may have been related to the North American Indian. When John Cabot discovered the island in 1497, these people were at the height of their prosperity. The doom of the natives was sealed with the coming of the white man. The struggle which was waged in the mainland between white man and Indian was also carried on in Newfoundland. The destruction was so complete that all we have left are a few skulls, a skeleton, some bones, and a collection of implements in a museum at St. John's.

THE PEOPLE OF THE ISLAND ARE NATIVE BORN

The population of the island is 247,710, of which one-third is engaged in fishing. The majority of the people live along the southeastern coast. There are few settlers in the interior and the French claims were a check to settlement on the west shores. The inhabitants are chiefly native born descendants of Irish, English and Scotch ancestors.

The chief occupation of the people is cod fishing. In many villages dried cod serve as money, with which people buy food, clothing and fishing tackle. There are three distinct branches of the industry, the Banks, the Shore and the Labrador fisheries. The Banks lie southward of the island, about thirty miles distant from the nearest land, and cover a great area. To these fishing grounds, which are huge submarine islands, which rise nearly to the surface of the water, the fishermen of France, Canada, the United States and the island go during the fishing season. The grounds are on the "high seas" and therefore subject to the jurisdiction of no country or nation. Schooners carrying from twelve to twenty men sail from the mainland and anchor. The crews go out from the schooners in pairs in flat-bottomed boats called dories. They fish with trawls, which are long lines supported at each end, and from which many short lines with baited hooks hang. Oftentimes a passenger on an ocean steamer is surprised as the fog lifts to see scores of small dories, anchored apparently in mid-ocean. Fogs and storms annually cause the death of many of these brave and hardy fishermen.

IMPORTANCE OF THE COAST FISHERIES TO THE ISLAND

Bank fishing is not of very great importance to Newfoundland. By far the greater number of the fishermen are engaged in coast fishing.

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Shore fishing is carried on from punts or skiffs. Those fishing from punts use ordinary hooks and lines. The fishermen with skiffs use traps. A trap is an enclosure of netting sunk in the sea and so arranged that the schools of cod in swimming by will blunder into it and become ensnared. The coast fishing is not so good as it was a few years ago. Thousands of fishermen, taking with them their wives and children, leave their homes every June and sail to the fishing grounds off the coast of Labrador. Some live in turf huts or timber shacks along the coast, while others live on the schooners. The women and children assist in curing the fish. They fish until October, when they return home with their catch.

THE FISHERMAN AT HOME IN HIS VILLAGE

A number of little, square, whitewashed, one story cottages nestling in the cliffs overlooking a bay or a cove is a typical fishing village. A score or more goats scamper among the neighboring rocks, as each household has one or more of these animals. Out into the water of the little harbor are built the stages at which the men land their fish. The cod are scaled by the men as they are caught, but the "splitting," "heading" and "salting" is generally done on shore by the women and children. After salting, the fish are taken to the "flakes"—rude scaffolds covered with under-brush—and there spread out to dry.

The hardy, sturdy fisherman lives, as a rule, from hand to mouth. The season's catch is usually mortgaged to the village merchant or "planter," who in turn loans sufficient to carry the poor fisherman through until the following October. This process continues from year to year. The boys are reared on the water and at six can manage a sail. After the fishing season closes in October, the men do little besides mend their nets and fishing tackle. They love to tell stories of their adventurous life and eagerly wait for the season to open in March. The Newfoundland fisherman, inhabiting more than a hundred such villages, is a hardy, burly, uncouth, warm-hearted, hospitable fellow, a blend of English, Irish and Scotch blood.

WHY COD ARE SO PLENTIFUL ABOUT THE ISLAND

The reason why the world's greatest cod fishing ground is centred at this island is interesting. The Arctic current which flows past Newfoundland carries with it hundreds of thousands of tons of minute living matter upon which the small shellfish and other creatures of the sea feed. In turn, these become the food of vast schools of cod. It is strange but true that the Arctic seas and rivers, in spite of the great cold with which they are surrounded, contribute most abundantly to this supply of living slime. Unless this flood from the Pole is stopped, the fishermen cannot lessen very much the supply of cod. Uncountable millions of cod will continue to come from the darker recesses of their unknown deep-sea homes and throng the Banks and shallower waters where conditions are suitable for breeding and where an abundant supply of food is found.

COD-LIVER OIL AND OTHER THINGS

All parts of the fish are used. Cod-liver oil is extracted from the livers. Glue is made from the skins while the heads and entrails are used for the manufacture of fertilizers. Great swarms of herring arrive along the coast during the early part of September. Large quantities are used as bait for cod, and packing herrings for food is fast becoming an important industry. Several lobster canneries are doing a thriving business along the southern coast. The sealing industry is not so important and profitable as it was and the open season for seal fishing now lasts only one month in the year, from the middle of March to the middle of April. If this restriction had not been made, the seals would have been killed off.

The Newfoundland dog, of which you have all heard, has almost died out on the island. It is supposed to have developed from a cross between the sledge dogs, which are closely related to the wolf, and other dogs brought from Europe.

MINERALS AND FORESTS IN THE ISLAND DOMINION

The early history of Newfoundland is filled with the story of struggles between the English and the French, for both nations claimed the island. It was ceded to Great Britain by the Treaty of Utrecht; but the treaty provided that the French were to have the same rights of fishing on the western shore as the English, and that neither nation was to make a permanent settlement on that shore.

CATCHING AND CURING CODFISH

Newfoundland may be said to live from the sea. The fisheries here are very important, and the chief subject of conversation is the size of the catch. These fish will soon be split open and spread to dry on the platform you see below. Later they will be packed and sold. The fishermen are very fine sailors.

The fish shown in the picture above have been split open and are here being rubbed by the fishermen with a salt mixture to preserve them. After this has been done and the salt has well soaked in, they are spread out in the sun to dry, as shown in the picture on the right. The racks upon which the fish are drying are called "flakes." The fish look like thick fleshy leaves as they lie in piles.

This provision led to serious troubles between Great Britain and France later on, and it was not until 1904 that the question was finally disposed of.

The early settlements were made in defiance of the rules laid down by the merchants who provided capital for the fishing. These merchants or "venturers," as they were called in the beginning, wished to keep the island as a fishing station merely, and contrived to have laws made which forbade permanent settlements within six miles of the shore. Men employed in the fisheries were forbidden to bring their families to the island, to live there during the winter, or to build themselves more than a rough shelter for the season. Families did find their way there and settlements were made; but the settlers were all fishermen, and fishermen for the most part they have remained. The men who were ready to brave any danger on the deep, made small effort to explore the land or to cultivate the narrow shore line that they knew. The villages and settlements were scattered, and there was much isolation and poverty. The fishermen are very brave, and are fine sailors, and many of them find their way into the British navy. Their heroism in the Great War has been noted even among the many heroic deeds of that dreadful time.

With the building of roads and railways, however, a new era was begun. The island was explored, and it was found that the interior is not, as was supposed, a desert. On the contrary, Newfoundland is a treasure house of minerals. There is scarcely a man who cannot show you on his mantel-shelf a specimen of the copper, iron, nickel and even gold ore of his neighborhood. Several thousand tons of copper and iron are produced yearly, but the industry is only in its infancy. Various mines of coal, asbestos, nickel, lead, and gold in different parts of the island are in various stages of development, and give promise of becoming properties of great value. Along the coasts and in the interior are large tracts of heavily-timbered land. Lumbering operations are extending rapidly. Large pulp mills have been built, and a great deal of pulp for the making of paper is exported, chiefly to England.

Farming has not been followed to any extent. Out of a large area of over five million acres of tillable land only one hundred thousand are under cultivation. The people do not care to work in factories and are not adapted to such employment. Nevertheless interest in farming is increasing, and the pulp mills have already brought greater prosperity to the island.

St. John's (32,292), the capital of the island, is on the southeast coast and is situated on one of the finest natural harbors in America. The city is entirely devoted to the fishing business. Harbor Grace (8,000), Carbonear (4,500), and Bonavista are the only other towns of importance.

THE GOVERNMENT OF THE ISLAND

The island did not join the Dominion of Canada, and the British Government still appoints the Governor. There are two chambers, the legislative council of fifteen members, appointed for life by the government of the day, and the legislative assembly, consisting of thirty-six members, elected for four years by ballot under manhood suffrage. The executive government is a ministry responsible to the legislature and holding office so long as they command a majority in the assembly. Newfoundland was made a Dominion in the year 1918 in recognition of the help given to the empire in the Great War.

The government of Newfoundland also controls the coast of Labrador, that strange, desolate, thinly-populated country which deserves a whole article itself. Perhaps you have heard of the work of the medical missionary, Doctor Wilfred Grenfell, who is devoting his life to the improvement of the lot of the fishermen there.

The possession of so many useful minerals, such vast tracts of forests, such large areas of fertile plains makes Newfoundland a country most favorably equipped for mining, lumbering, agriculture and manufacturing. With capital, enterprise and labor the island is destined to become a great producing and exporting country.

Newfoundland, as we have read in other parts of the book, has played a great part in the history of wireless telegraphy. It was on a high cliff near St. John's that Marconi set up the first instrument that caught a message, through the air, across the ocean.

THE NEXT STORY OF CANADA IS ON PAGE 6345.

WHERE THE SEA GIVES A LIVELIHOOD

Near St. John's is the quaint little village of Quidi Vidi, where one can see every process in curing and packing fish. Notice the platform upon which the fish are spread to dry, and the towering hills around the little harbor. Every village has its fish platforms, called "flakes." There are few factories to provide work in the towns and the people continue to live in their seaside homes. Some now live on farms.

This is a picture of the rocky, winding entrance to the quaint little harbor of Quidi Vidi, which is shown above. The men have been out for a hard day's fishing along the coast and are now coming back with loaded boats at evening time for a well-earned rest. The picture gives a good idea of the rugged coast of the island dominion, which was the first English colony in the New World.

THE DESERTED PALACE OF PEACE AT THE HAGUE

Soon after the first Conference to discuss the possibility of putting an end to war, which met at The Hague, the capital of the Netherlands, in 1899, Andrew Carnegie announced that he would build a permanent home for the Conference and the Court of Arbitration appointed to sit there. The building was completed at the cost of more than $1,500,000, but the Court has not had the desired effect. The greatest war in history broke out after the completion of the building.

A GREAT HISTORICAL POEM

ONE of the best known poems of Thomas Gray, the English poet, is "The Bard," which he finished in 1757. The Bard is an old Welsh minstrel who halts Edward I of England, conqueror of Wales (Cambria), to terrify him by foretelling the fate of English kings. After lamenting over fallen Welsh kings and bards (stanzas 2 and 3), the singer predicts the death of Edward II at Berkeley Castle, and the wars with France under Edward III (4); the death of Edward III and his son, the Black Prince (5); Richard II; the Wars of the Roses; the murders in the Tower of Henry VI and the little princes; the fall of Richard III ("the bristled Boar"); the marriage of Henry VII (Lancaster) with Elizabeth of York (6); the glory of England under the Tudors, who were of Welsh descent, especially of Queen Elizabeth's reign, with the poetry of Shakespeare and Milton (7, 8 and 9).

THE BARD

CONTINUED FROM 6089

"RUIN seize thee, ruthless King!
Confusion on thy banners wait;
Tho' fanned by Conquest's crimson wing,
They mock the air with idle state.
Helm, nor hauberk's twisted mail,
Nor e'en thy virtues, Tyrant, shall avail
To save thy secret soul from nightly fears,
From Cambria's curse, from Cambria's tears!"
Such were the sounds that o'er the crested pride
Of the first Edward scattered wild dismay,
As down the steep of Snowdon's shaggy side
He wound with toilsome march his long array.
Stout Glo'ster stood aghast in speechless trance:
"To arms!" cried Mortimer, and couched his quivering lance.

On a rock, whose haughty brow
Frowns o'er cold Conway's foaming flood,
Robed in the sable garb of woe,
With haggard eyes the poet stood;
(Loose his beard, and hoary hair
Streamed, like a meteor, to the troubled air);
And with a master's hand, and prophet's fire,
Struck the deep sorrows of his lyre.
"Hark, how each giant-oak, and desert cave,
Sighs to the torrent's awful voice beneath!
O'er thee, oh King! their hundred arms they wave,
Revenge on thee in hoarser murmurs breathe;
Vocal no more, since Cambria's fatal day,
To high-born Hoel's harp, or soft Llewellyn's lay.

"Cold is Cadwallo's tongue,
That hushed the stormy main:
Brave Urien sleeps upon his craggy bed:
Mountains, ye mourn in vain
Modred, whose magic song
Made huge Plinlimmon bow his cloud-topt head.
On dreary Arvon's shore they lie,
Smeared with gore, and ghastly pale:
Far, far aloof th' affrighted ravens sail;
The famished eagle screams, and passes by.
Dear lost companions of my tuneful art,
Dear as the light that visits these sad eyes,
Dear as the ruddy drops that warm my heart,
Ye died amidst your dying country's cries—
No more I weep. They do not sleep.
On yonder cliffs, a grisly band,
I see them sit, they linger yet,
Avengers of their native land:
With me in dreadful harmony they join,
And weave with bloody hands the tissue of thy line.

"Weave the warp, and weave the woof,
The winding sheet of Edward's race.
Give ample room, and verge enough
The characters of hell to trace.
Mark the year, and mark the night,
When Severn shall re-echo with affright
The shrieks of death, thro' Berkeley's roof that ring,
Shrieks of an agonizing king!
She-wolf of France, with unrelenting fangs,
That tear'st the bowels of thy mangled mate,
From thee be born, who o'er thy country hangs
The scourge of heaven. What terrors round him wait!

Amazement in his van, with flight combined,
And sorrow's faded form, and solitude behind.

"Mighty victor, mighty lord!
Low on his funeral couch he lies!
No pitying heart, no eye, afford
A tear to grace his obsequies.
Is the sable warrior fled?
Thy son is gone. He rests among the dead.
The swarm, that in thy noontide beam were born?
Gone to salute the rising morn.
Fair laughs the morn, and soft the zephyr blows,
While proudly riding o'er the azure realm
In gallant trim the gilded vessel goes;
Youth on the prow, and Pleasure at the helm;
Regardless of the sweeping whirlwind's sway,
That, hushed in grim repose, expects his evening prey.

"Fill high the sparkling bowl,
The rich repast prepare;
Reft of a crown, he yet may share the feast:
Close by the regal chair
Fell Thirst and Famine scowl
A baleful smile upon their baffled guest.
Heard ye the din of battle bray,
Lance to lance, and horse to horse?
Long years of havoc urge their destined course,
And thro' the kindred squadrons mow their way.
Ye towers of Julius, London's lasting shame,
With many a foul and midnight murder fed,
Revere his consort's faith, his father's fame,
And spare the meek usurper's holy head.
Above, below, the rose of snow,
Twined with her blushing foe, we spread:
The bristled boar in infant-gore
Wallows beneath the thorny shade.
Now, brothers, bending o'er the accursed loom,
Stamp we our vengeance deep, and ratify his doom.

"Edward, lo! to sudden fate
(Weave we the woof. The thread is spun.)
Half of thy heart we consecrate.
(The web is wove. The work is done.)
Stay, oh stay! nor thus forlorn
Leave me unblessed, unpitied, here to mourn;
In yon bright track, that fires the western skies,
They melt, they vanish from my eyes.
But oh! what solemn scenes on Snowdon's height
Descending slow their glittering skirts unroll?
Visions of glory, spare my aching sight!
Ye unborn ages, crowd not on my soul!
No more our long-lost Arthur we bewail.
All hail, ye genuine kings, Britannia's issue, hail!

"Girt with many a baron bold
Sublime their starry fronts they rear;
And gorgeous dames, and statesmen old
And bearded majesty, appear.
In the midst a form divine!
Her eye proclaims her of the Briton-line;
Her lion-port, her awe-commanding face,
Attempered sweet to virgin-grace.
What strings symphonious tremble in the air,
What strains of vocal transport round her play!
Hear from the grave, great Taliessin, hear;
They breathe a soul to animate thy clay.
Bright Rapture calls, and soaring as she sings,
Waves in the eye of heaven her many-colored wings.

"The verse adorn again
Fierce war, and faithful love,
And truth severe, by fairy fiction drest.
In buskined measures move
Pale grief, and pleasing pain,
With horror, tyrant of the throbbing breast.
A voice, as of the cherub-choir,
Gales from blooming Eden bear;
And distant warblings lessen on my ear,
That lost in long futurity expire.
Fond impious man, think'st thou yon sanguine cloud,
Raised by thy breath, has quenched the orb of day?
To-morrow he repairs the golden flood,
And warms the nations with redoubled ray.
Enough for me; with joy I see
The different doom our fates assign.
Be thine despair, and sceptred care,
To triumph, and to die, are mine."
He spoke, and headlong from the mountain's height
Deep in the roaring tide he plunged to endless night.

O WERT THOU IN THE CAULD BLAST

There is no poetry in the English language so simple in the choice of subjects, so natural in expression, so touching in sentiment, as the poetry of Robert Burns, "the ploughman of Ayrshire." The field-mouse, the daisy, the lassie he loves, he sings about so sweetly that it almost moves to tears. Although he has written a number of long poems, like "Tam O'Shanter" and "The Cotter's Saturday Night," found on page 4063, it is his lyrics like this little poem which have endeared him to all hearts.

O, WERT thou in the cauld blast,
On yonder lea, on yonder lea;
My plaidie to the angry airt,
I'd shelter thee, I'd shelter thee;
Or did misfortune's bitter storms
Around thee blaw, around thee blaw,
Thy bield should be my bosom,
To share it a', to share it a'.

Or were I in the wildest waste,
Sae black and bare, sae black and bare,
The desert were a paradise,
If thou wert there, if thou wert there.
Or were I monarch o' the globe,
Wi' thee to reign, wi' thee to reign,
The brightest jewel in my crown
Wad be my queen, wad be my queen.

THE BELL OF ATRI

Longfellow is pre-eminent among modern poets in his gift of narrative poetry, or the art of telling again in tuneful verse some old, old story. In the following he gives us, with admirable art and sympathy, an old legend of an Italian town. The story is told so simply that scarcely any detail requires explanation, but it will help the young readers to know that "Giovanni" is the Italian for John, and "Re" for King.

AT Atri, in Abruzzo, a small town
Of ancient Roman date, but scant renown,
One of those little places that have run
Half up the hill, beneath a blazing sun,
And then sat down to rest, as if to say,
"I climb no farther upward, come what may,"
The Re Giovanni, now unknown to fame,
So many monarchs since have borne the name,
Had a great bell hung in the market-place
Beneath a roof, projecting some small space,
By way of shelter from the sun and rain.
Then rode he through the streets with all his train,
And, with a blast of trumpets loud and long,
Made proclamation, that whenever wrong
Was done to any man, he should but ring
The great bell in the square, and he, the King,
Would cause the Syndic to decide thereon.
Such was the proclamation of King John.

How swift the happy days in Atri sped,
What wrongs were righted need not here be said.
Suffice it that, as all things must decay,
The hempen rope at length was worn away,
Unraveled at the end, and, strand by strand,
Loosened and wasted in the ringer's hand,
Till one, who noted this in passing by,
Mended the rope with braids of briony,
So that the leaves and tendrils of the vine
Hung like a votive garland at a shrine.

By chance it happened that in Atri dwelt
A knight, with spur on heel and sword in belt,
Who loved to hunt the wild boar in the woods,
Who loved his falcons with their crimson hoods,
Who loved his hounds and horses, and all sports,
And prodigalities of camps and courts;
Loved, or had loved them; for at last, grown old,
His only passion was the love of gold.

He sold his horses, sold his hawks and hounds,
Rented his vineyards and his garden grounds,
Kept on one steed, his favorite steed of all,
To starve and shiver in a naked stall,
And day by day sat brooding in his chair,
Devising plans how best to hoard and spare.

At length he said: "What is the use or need
To keep at my own cost this lazy steed,
Eating his head off in my stables here,
When rents are low and provender is dear?
Let him go feed upon the public ways;
I want him only for the holidays."
So the old steed was turned into the heat
Of the long, lonely, silent, shadeless street;
And wandered in suburban lanes forlorn,
Barked at by dogs, and torn by briar and thorn.

One afternoon, as in that sultry clime
It is the custom in the summer-time,
With the bolted doors and window-shutters closed,
The inhabitants of Atri slept or dozed;
When suddenly upon their senses fell
The loud alarum of the accusing bell!
The Syndic started from his deep repose,
Turned on his couch, and listened, and then rose
And donned his robes, and with reluctant pace
Went panting forth into the market-place,

Where the great bell upon its crossbeam swung,
Reiterating with persistent tongue,
In half-articulate jargon, the old song:
"Someone hath done a wrong, hath done a wrong!"

But ere he reached the belfry's light arcade
He saw, he thought, beneath its shade,
No shape of human form of woman born,
But a poor steed, dejected and forlorn,
Who, with uplifted head and eager eye,
Was tugging at the vines of briony.
"Domeneddio!" cried the Syndic straight,
"This is the Knight of Atri's steed of state!
He calls for justice, being sore distressed,
And pleads his cause as loudly as the best."

Meanwhile from street and lane a noisy crowd
Had rolled together like a summer cloud,
And told the story of the wretched beast
In five-and-twenty different ways at least,
With much gesticulation and appeal
To heathen gods, in their excessive zeal.

The knight was called and questioned; in reply
Did not confess the fact, did not deny;
Treated the matter as a pleasant jest,
And set at naught the Syndic and the rest,
Maintaining, in an angry undertone,
That he should do what pleased him with his own.

And thereupon the Syndic gravely read
The proclamation of the King; then said:
"Pride goeth forth on horseback grand and gay,
But cometh back on foot, and begs its way;
Fame is the fragrance of heroic deeds,
Of flowers of chivalry and not of weeds!
These are familiar proverbs, but I fear
They never yet have reached your knightly ear.
What fair renown, what honor, what repute
Can come to you from starving this poor brute?
He who serves well and speaks not, merits more
Than they who clamor loudest at the door.
Therefore the law decrees that as this steed
Served you in youth, henceforth you shall take heed
To comfort his old age, and to provide
Shelter in stall, and food and field beside."

The knight withdrew, abashed; the people all
Led home the steed in triumph to his stall.
The King heard and approved, and laughed in glee,
And cried aloud: "Right well it pleaseth me!
Church-bells at best but ring us to the door,
But go not in to Mass; my bell doth more:
It cometh into court and pleads the cause
Of creatures dumb and unknown to the laws;
And this shall make, in every Christian clime,
The bell of Atri famous for all time."

THE MILLER OF THE DEE

Charles Mackay's songs always breathe a genial spirit, and this is one of the heartiest. The joy of inward health and gay content is caroled so naturally by the happy miller that he is envied by a passing king. Notice how well a story may be told in easy words. Out of 201 words in these verses 177 are of one syllable, and only one—"nobody"—has three.

THERE dwelt a miller hale and bold
Beside the River Dee;
He wrought and sang from morn to night,
No lark more blithe than he;
And this the burden of his song
For ever used to be—
"I envy nobody, no, not I,
And nobody envies me!"

"Thou'rt wrong, my friend!" said old King Hal,
"Thou'rt wrong as wrong can be;
For could my heart be light as thine
I'd gladly change with thee.
And tell me now what makes thee sing
With voice so loud and free,
While I am sad, though I'm the king,
Beside the River Dee?"

The miller smiled and doffed his cap:
"I earn my bread," quoth he;
"I love my wife, I love my friends,
I love my children three;
I owe no penny I cannot pay;
I thank the River Dee,
That turns the mill and grinds the corn,
To feed my babes and me."

"Good friend!" said Hal, and sighed the while,
"Farewell, and happy be;
But say no more, if thou'dst be true,
That no one envies thee.
Thy mealy cap is worth my crown,
Thy mill my kingdom's fee!
Such men as thou are England's boast,
O miller of the Dee!"

I SAW A NEW WORLD

In this poem, W. B. Rands shows what a mess might be made of the world if it were to be fixed without change, and how interesting it is with all its surprises and strife and hope and dreams.

I SAW a new world in my dream,
Where all the folks alike did seem;
There was no Child, there was no Mother,
There was no Change, there was no Other.

For everything was Same, the Same;
There was no Praise, there was no Blame;
There was neither Need nor Help for it;
There was nothing fitting, or unfit.

Nobody laughed, nobody wept;
None grew weary, so none slept;
There was nobody born, and nobody wed;
This world was a world of the living dead.

I longed to hear the Time-Clock strike
In the world where the people were all alike;
I hated Same, I hated Forever,
I longed to say Neither, or even Never.

I longed to mend, I longed to make,
I longed to give, I longed to take,
I longed for a change, whatever came after,
I longed for crying, I longed for laughter.

THE WILD ROSE

The following is one of the most widely known of Goethe's lyrics. The encounter between the selfish boy and the delicate rose, who has only her thorns to protect her, is delightfully portrayed. Franz Schubert composed the music for this pretty lyric.

A BOY espied, in morning light,
A little rosebud blowing;
'Twas so delicate and bright
That he came to feast his sight,
And wonder at its growing.
Rosebud, rosebud, rosebud red,
Rosebud brightly blooming.

"I will gather thee,"—he cried,—
"Rosebud brightly glowing!"
"Then I'll sting thee," it replied,
"And you'll quickly start aside
With the prickle glowing."
Rosebud, rosebud, rosebud red,
Rosebud brightly blowing.

But he plucked it from the plain,
The rosebud brightly blowing!
It turned and stung him, but in vain—
He regarded not the pain,
Homeward with it going.
Rosebud, rosebud, rosebud red,
Rosebud brightly blowing.

THE MOSS ROSE

This little poem is by Krummacher, who is classed with William Cullen Bryant as a nature poet. He is especially noted for his poems about the Alps.

THE Angel of the flowers, one day,
Beneath a rose tree sleeping lay,—
That spirit to whose charge 'tis given
To bathe young buds in dews of heaven.
Awakening from his light repose,
The Angel whispered to the rose:
"O fondest object of my care,
Still fairest found, where all are fair,
For the sweet shade thou giv'st to me
Ask what thou wilt, 'tis granted thee."
"Then," said the rose with deepened glow,
"On me another grace bestow."
The spirit paused in silent thought,—
What grace was there that flower had not?
'Twas but a moment, o'er the rose
A veil of moss the Angel throws,
And, robed in nature's simplest weed,
Could there a flower that rose excel!

THE PRETTY FISHER MAIDEN

Heinrich Heine wrote this song, for which Franz Schubert wrote the music. It is one of the best known German lyrics which have made him popular.

COME, fairest fisher maiden, here
Put, put thy skiff to land;
Come close to me and sit thee down,
And prattle hand in hand.

Oh, lay thy head upon my heart,
Have not such fear of me,
Thou trustest day by day thyself
Unto the wild, wild sea.

My heart is like the sea, it hath
Its storm, and ebb and flow;
And many pretty pearls, my love,
Rest in its depth below.

WHITHER?

Wilhelm Müller, just as Heine, implies that all water is inhabited by some fairy or water nymph. It is a fanciful idea to suggest that instead of the noise caused by the water flowing over the rocks and pebbles, the nymphs are singing their alluring songs.

I HEARD a brooklet gushing
From its rocky fountain near,
Down into the valley rushing,
So fresh and wondrous clear.

I know not what came o'er me,
Nor who the counsel gave;
But I must hasten downward,
All with my pilgrim stave;

Downward and ever farther
And ever the brook beside,
And ever fresher murmured
And ever clearer the tide.

Is this the way I was going?
Whither, O brooklet, say!
Thou hast, with thy soft murmur,
Murmured my senses away.

What do I say of a murmur?
That can no murmur be;
'Tis the water-nymphs, that are singing
Their roundelays unto me.

Let them sing, my friend, let them murmur,
And wander merrily near;
The wheels of a mill are going
In every brooklet clear.

TO MY SISTER

"To My Sister" was written by Heine, when, as a middle-aged man, he visited the house in which he was born. This is a splendid example of the poet's delightful simplicity of style. Heinrich Heine, as many other poets, vividly recalls his childhood days.

MY child, when we were children,
Two children small and gay,
Who would creep into the hen-house,
And hide us in the hay,

We cackled like the young cockerels
And to everybody going,
"Cock-a-doodle-doo!"—we cried;
And they thought the cocks were crowing.

We spread old bits of carpet
On some chests within the court;
And there we lived together
In a house of the finest sort.

An old cat of our neighbors
Often came to make a call;
We made her bows and courtesies
And compliments and all.

We made very kind inquiries
About the health of our old friend;
Since then we have had to put the same
To old cats without end.

We used to sit conversing
In a solemn, elderly way,
Complaining, how much better
Things had been in our day;

How Love, Truth, and Religion
One hardly ever met;
How coffee had grown very dear
And money hard to get.

They all are gone—the little games
We played at in our youth,
And money, and the good old times
And Religion, Love and Truth.

THE CASTLE BY THE SEA

This poem is by Uhland, and at the time in which he lived Germany was divided into many small principalities. These were constantly at war with one another. The castle so beautifully described is Germany trying to stand against the tyranny of the government. The daughter is Freedom, who no longer lives with her parents in the lordly castle by the sea.

HAST thou seen that lordly castle,
That castle by the sea!
Golden and red above it
The clouds float gorgeously.

And fain it would stoop downward
To the mirrored waves below;
And fain it would soar upward
In the evening's crimson glow.

Well have I seen that castle,
That castle by the sea,
And the moon above it standing,
And the mist rise solemnly.

The winds and waves of ocean,
Had they a merry chime?
Didst thou hear, from those lofty chambers
The harp and the minstrels rhyme?

The winds and the waves of ocean,
They rested quietly;
But I heard on the gale a sound of wail,
And tears came to mine eyes.

And sawest thou on the turrets
The King and his royal bride,
And the wave of their crimson mantles,
And the golden crown of pride?

Led they not forth in rapture
A beauteous maiden there,
Resplendent as the morning sun,
Beaming with golden hair?

Well, I saw the ancient parents,
Without the crown of pride.
They were moving slow in weeds of woe,
No maiden was by their side.

REST

These thoughts in verse are from the great German poet Goethe—the greatest of all German poets and writers, and one of the giants of European literature. He lived between 1749 and 1832. These six lines are worth careful study as an instance of compression of thought. Nine thoughts are expressed in less than fifty words in this fine little poem.

REST is not quitting the busy career;
Rest is the fitting of self to one's sphere.

'Tis the brook's motion clear without strife;
Fleeting to ocean after its life.

'Tis loving and serving the highest and best;
'Tis onward, unswerving, and this is true rest.

THE ERL KING

Goethe tells the story of a father bringing home his sick child, who, in his delirium, believes that the branches of the trees are the Erl king and his daughters trying to seize him. The Erl king, according to German legends, is the spirit which dwells in the willow tree. The poem has been set to music by Franz Schubert as well as many other lyrics.

WHO rides there so late through the night—dark and drear?
The father it is, with his infant so dear,
He holdeth the boy tightly clasped in his arm.
He holdeth him safely, he keepeth him warm.

"My son, wherefore seek'st thou thy face thus to hide?"
"Look, father, the Erl king is close to our side!
Dost thou see not the Erl king with crown and with train?"
"My son, 'tis the mist rising over the plain."

"Oh, come, thou dear infant—oh, come thou with me!
Full many a game, I will play there with thee;
On my strand, lovely flowers their blossoms unfold.
My mother shall grace thee with garments of gold."

"My father, my father, and dost thou not hear
The words that the Erl king now breathes in mine ear?"
"Be calm, dearest child, 'tis thy fancy deceives;
'Tis the sad wind that sighs through the withering leaves."

"Wilt go then, dear infant, wilt go with me there?
My daughters shall tend thee with sisterly care,
My daughters by night their glad festival keep,
They'll dance thee, and rock thee and sing thee to sleep."

"My father, my father, and dost thou not see,
How the Erl king, his daughters has brought here for me?"
"My darling, my darling, I see it aright,
'Tis the aged gray willows deceiving thy sight."

"I love thee, I'm charm'd by thy beauty, dear boy!
And if thou'rt unwilling, then force I'll employ."
"My father, my father, he seizes me fast.
Full sorely the Erl king has hurt me at last."

The father now gallops, with terror, half wild,
He grasps in his arms the poor shuddering child,
He reaches his courtyard with toil and with dread,
The child in his arms finds he motionless, dead.

LITTLE VERSES FOR VERY LITTLE PEOPLE

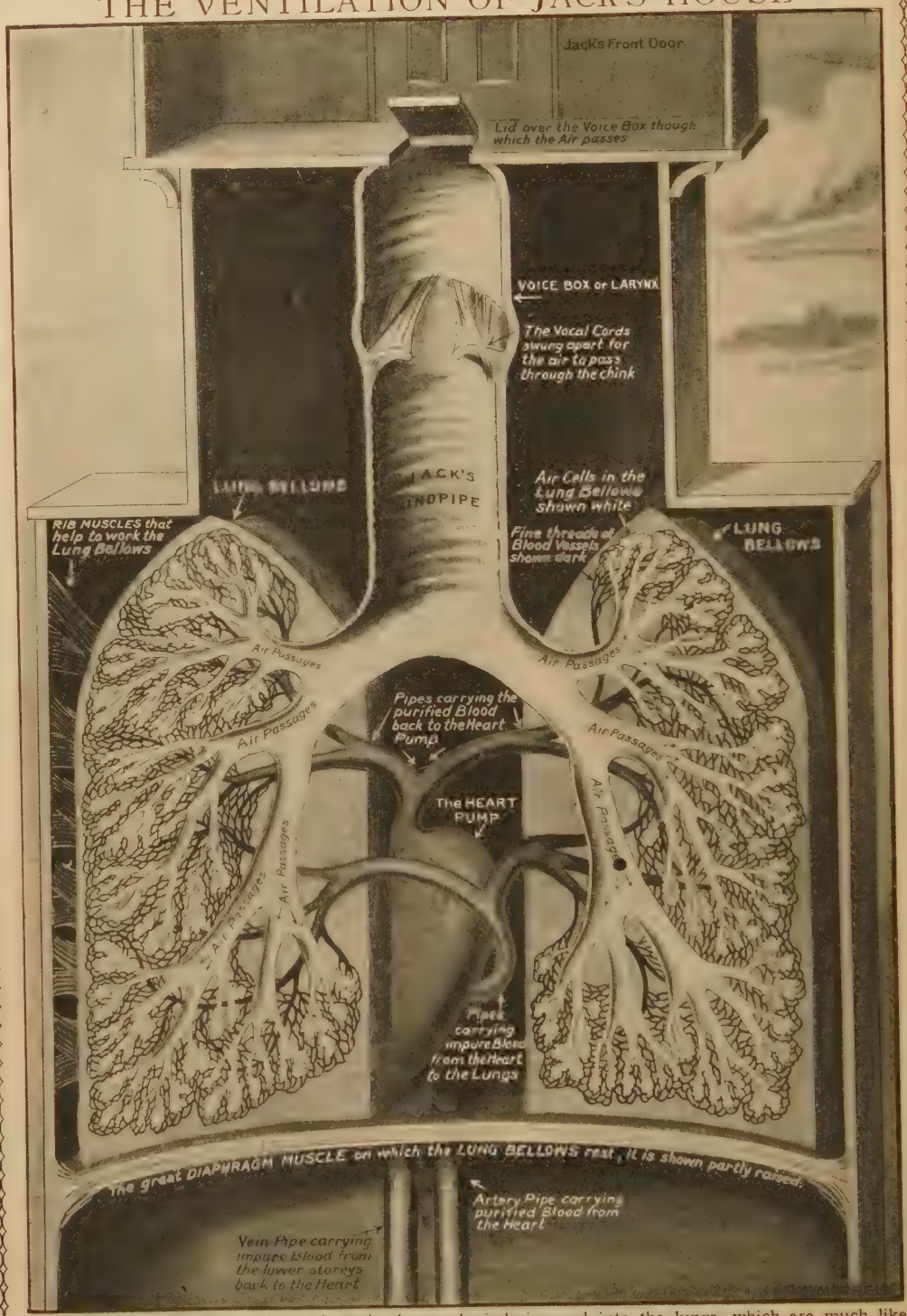
RHYMES AND JINGLES AND THEIR USE

WHAT is the use of Nursery Rhymes? Did any boy or girl ever ask that? Perhaps not; but it is worth asking. The answer is very simple. Just as we all like stories, so do most of us like poems, which are stories told in words that sound pleasant in our ears, and are easy to remember. But before we can learn poems we learn little verses about funny little folk, and these are called nursery rhymes, because all mothers say them to their children, and the sounds of the words are easy to bear in mind. In this part of our book we have given all the best-known nursery rhymes, many of them having clever pictures with them.

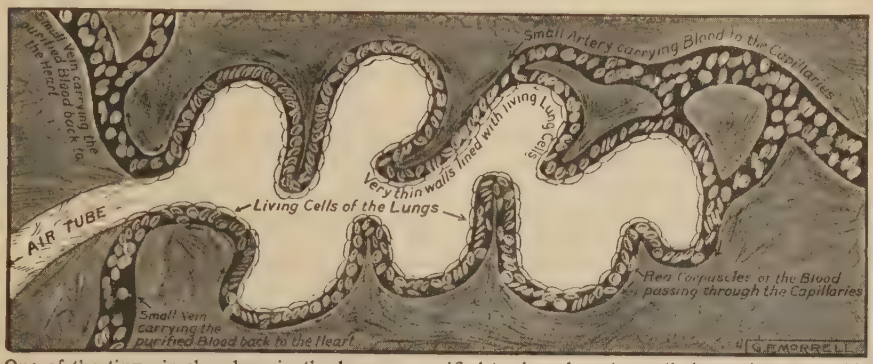
RIDE A COCK-HORSE TO BANBURY CROSS

Ride a cock-horse to Banbury Cross,
To see a fine lady upon a white horse;
Rings on her fingers, and bells on her toes,
She will have music wherever she goes.

THE VENTILATION OF JACK'S HOUSE


Jack's Front Door
Lid over the Voice Box though which the Air passes
VOICE BOX or LARYNX
The Vocal Cords swung apart for the air to pass through the chink
Air Cells in the Lung Bellows shown white
Fine threads of Blood Vessels shown dark
RIB MUSCLES that help to work the Lung Bellows
LUNG BELLOWS
Air Passages
Air Passages
Air Passages
Air Passages
Air Passages
Air Passages
Pipes carrying the purified Blood back to the Heart
The HEART PUMP
Pipes carrying impure Blood from the Heart to the Lungs
The great DIAPHRAGM MUSCLE on which the LUNG BELLOWS rest, it is shown partly raised
Artery Pipe carrying purified Blood from the Heart
Vein Pipe carrying impure Blood from the lower storeys back to the Heart

Air goes in the front door, down the voice-box and wind-pipe, and into the lungs, which are much like sponges, with thousands of hollow spaces lined with living cells. These cells lie between the air and the blood in the hollow spaces, and purify the blood by taking oxygen from the air and sending it into the blood, and by driving the carbon dioxide and water from the blood into the air, to be breathed out again.


Small Vein carrying the purified Blood back to the Heart
Small Artery carrying Blood to the Capillaries
Very thin walls lined with living Cells
AIR TUBE
Living Cells of the Lungs
Red Corpuscles of the Blood passing through the Capillaries
Small Vein carrying the purified Blood back to the Heart
G.E.MORRELL

One of the tiny air-chambers in the lungs, magnified to show how its walls have air on one side and blood on the other. Little muscles expand and contract the air-chamber alternately.

THE WONDERFUL RIVER OF AIR

AND THE WAY IN WHICH IT KEEPS JACK'S BLOOD PURE

CONTINUED FROM 6234

EXCEPT in special need, when Jack is compelled to ventilate his house through his front door, all the air he uses must pass through a complicated filter, warmer, and moistener, which we call his nose. Suppose we have reached the back of his nose, and find a supply of very nearly pure, moist, warm, almost dustless air.

There is some distance yet to go before the air reaches Jack's bellows, or lungs. First it comes to the opening of his great windpipe, which runs down the front of his neck. This pipe must always be kept open, of course, and so it is stiffened with little rings of gristle, or cartilage.

We can readily feel these in our own windpipe just before it leaves the neck and plunges into our middle story. But above the rings there is something much larger, and this is Jack's voice-box, or speaking-machine, of which the proper name is the larynx. Now, before the air which has passed through Jack's filter can reach the windpipe, it must pass through the voice-box.

There is a little risk here, nevertheless. Jack's larynx is, so to say, a new idea, and has had to be contrived as an addition to Jack's house. So far as the inlet of air goes, his voice-box is simply a difficulty. It does no good, and it makes no use of the air which goes in—only of the air which comes out.

There are two difficulties, really. First, the air-current and the food-current cross each other's paths—which does not seem to us to be the best arrangement. Jack's wind-pipe lies in front of his gullet, and every morsel of food and every drop of fluid that enters his gullet has to jump over the opening of his voice-box.

To help this business, his voice-box is provided with a movable lid, attached to the back of his tongue, and when he swallows this lid partly closes over the opening to the voice-box, and partly diverts the current of food to one side, so that nothing goes the wrong way. But, of course, while Jack is breathing, his voice-box must be freely open, and therefore it is quite certain that, whatever happens, he must not try to breathe and swallow at the same time; but sometimes he may laugh—which requires a good in-breath—when he is swallowing, and then he is likely to choke. A choking fit may be unpleasant, but at the same

time it is very interesting. Of course, whatever happens, Jack's ventilation must go on, and therefore his ventilation shaft must be kept clear. When he chokes something has got into the ventilation shaft, and immediately the whole body gives up all other interests and occupations and sets itself to expel the obstruction at once.

For this purpose Jack's house is provided with a large number of powerful servants, or muscles, which can all contract the cavity of his chest. No sooner does the ventilation system come to hold an intruder than the sentinels in its walls send up a message to one of the lower telephone exchanges—not to Jack himself—and the order goes forth to cough and cough and cough again. A cough means that we have contracted some of the muscles so as to force air out of the chest quite violently, and thus the obstruction is blown away. Cells inside the windpipe set to work to produce a smooth fluid, so as to make the passage of the intruder easy; and the body will devote itself with such force to this important task that Jack's eyes may fill with tears.

THE NARROW WAY THROUGH WHICH THE AIR MUST PASS

When the air, apart from such accidents, has passed into the voice-box, it comes at once to a narrow chink, and through this it has to pass. Such a chink would never exist in such a place, were it not for a very peculiar purpose.

The edges of this chink are made of elastic fibres, and they are there placed so as to make sounds when Jack's air strikes against them in coming out. So we shall return to them, but meanwhile we only note that these vocal cords, as they are called, which line the chink, are so placed that they can be swung apart whenever Jack takes a breath. And that is what happens. Before every breath that Jack takes, from the cradle to the grave, the unsleeping brain-cells give orders to the muscles which stand beside his vocal cords, and then the muscles swing the cords apart, so that the air can enter.

Sometimes certain abominable burglars, called the microbes of diphtheria, get into Jack's throat and produce a thick white stuff which may cover over this chink, and then Jack is in danger of death. But nowadays men call in horses to save Jack in such a case. Tiny doses of what the microbes make are given to horses, and the cell-chemists of the horses make something which will dissolve this dangerous stuff. The medicine the horses make is called the diphtheria anti-toxin, and it saves the lives of thousands of children and numbers of grown people all the world over every year.

THE HUNDREDS OF TUBES WHICH CARRY THE AIR TO THE LUNGS

Now when the passage to the chest is closed, the air has a clear passage down the windpipe until the windpipe splits into two, one going to the right and the other to the left. One branch supplies the right lung and the other supplies the left lung. These branches divide over and over again, like a tree, until at last the air is led, by hundreds of little tubes, to the very stuff of the lungs themselves.

The lungs are certainly a pair of bellows, but we find that they consist of a kind of sponge of thousands of tiny hollow spaces, into which the air enters. These little spaces are lined by the living cells of the lungs, and on the other side of this lining of cells is a tremendous number of tiny blood-vessels which carry blood from Jack's heart. So what we find in the stuff or tissue of the lungs is air on one side, blood on the other, and a layer of living lung-cells in between.

THE LITTLE VISITORS TO THE LUNGS AND WHY THEY COME

This blood is not bright blood, but dark blood. It has been sent to the lungs from the right side of Jack's great pump, to which it had just been returned after traveling all through his body. This blood contains a quantity of carbon dioxide, a poison, which it has brought to the lungs from Jack's body, and it also contains more water than it needs. On the other hand, the countless millions of red cells which it contains, the air-porters of Jack's house, are empty-handed. They have no oxygen, for what they got when they were last in the lungs they have given away to Jack's body, and now they have come back to get more from the fresh air that Jack has just breathed in.

What happens, then, is quite simple. Through the thin layer of lung-cells there passes a double stream of gases—a stream from the air to the blood, and a stream from the blood to the air. The

lung-cells supervise and direct them both. The carbon dioxide and the unnecessary water pass into the air—we can see the water when we breathe out on to a window-pane—and the oxygen of the air passes into the blood. In order to make these two exchanges Jack has a ventilation system, and that is what we are all doing day and night without ceasing, as we breathe. We are getting oxygen into our blood, and carbon dioxide and water out of it.

THE LITTLE RED PORTERS WHO PACK AWAY THE OXYGEN

The oxygen in the air is at once picked up by the red porters who are in the blood for the purpose, and who can pack away a most extraordinary quantity of it. Of course, a little oxygen can be dissolved in blood just as it can in water, but Jack's house could never do with the little amount which his blood itself would dissolve. The red porters make all the difference. Each of them can squeeze together and pack on his shoulders, so to say, an astonishing quantity of oxygen for his size.

The blood, with its air-laden porters, after leaving the lungs, returns to the left side of Jack's great pump, and is at once driven onward to supply every part of his body with oxygen. All the red cells leave the pump in one great channel, but it soon divides, and one cell may find itself traveling through one of Jack's toes, while another may be rushing through his eye-sentinels. No part of Jack's house is forgotten.

THE GIVING OUT OF THE FRESH AIR TO ALL PARTS OF JACK'S HOUSE

In every case the walls of the blood-tubes soon become thinner and thinner. And now we can see happen exactly what happened a little while before in the lungs, except that the process is reversed. In the lungs the red porters got oxygen; now they give it. It is for this that they exist. Most of the cells of Jack's body are far away from the air, and if they are to live air must be brought to them. That is what the bellows and the pump and the red porters exist for. Each little porter hands over to the gasping cells of Jack's toes or eyes or liver or muscles the air that they want; and then the red cells, not quite so red as they were, hasten back to the pump.

But we must not forget the carbon dioxide and water. The cells want oxygen for burning. They want to get the power and the warmth, and the fuel they burn is mostly carbon—very like our coal—and hydrogen. When carbon is burned with oxygen we get carbon dioxide, and when hydrogen is burned with oxygen we get water. The cells of Jack's house are always producing carbon dioxide and water, and so the blood which leaves Jack's toe or eye is poorer in oxygen but fuller of water and carbon dioxide, and while its empty-handed red cells scurry back to the lungs for more oxygen, it also carries these waste matters, one of which is a rank poison, to the lungs. As soon as they reach the lungs they are breathed out on the air, and this is why the air of a room in which there are a number of people must be constantly changed. If, for instance, a schoolroom is not well ventilated the air which the children breathe will soon have too little oxygen, and they will begin to do poor work.

THE OVERSEERS WHO LOOK AFTER JACK'S BREATHING

We may now consider the air which has got into the lungs, and how it gets out again. It is by no means the same air, and is also warmer than when it entered, for it has been for a little while quite close to Jack's warm blood.

The air returns by the same route all the way until it reaches the filter, where it takes a slightly different course. On the way, of course, it has to pass through the chink again, but as a rule it does so without difficulty or sound—though not so, of course, when Jack desires to speak or sing.

For us now one more question remains: What drives the air in when we breathe in, and what drives it out when we breathe out? If we notice ourselves we shall agree, assuming that we are quite well, that it is the breathing-in that costs us effort; the breathing-out seems to do itself, and that is quite true. Breathing-in, or inspiration, is like stretching a piece of elastic, and breathing-out, or expiration, is like letting it go again.

Every inspiration is done by certain of Jack's muscles, which exist for the purpose, and are all under the command of a special group of overseers in the lowest part of his brain. These give their orders for an inspiration about

sixteen or eighteen times a minute, but faster or slower according to circumstances. In fever, or if Jack is running hard, and so using up a lot of oxygen, he breathes much more rapidly. On the other hand, if Jack gives orders himself, on purpose, from his own study, and quickly takes a number of extra long breaths, he will find that for a little while afterwards he scarcely takes any breaths at all. He has no need to do so, for the blood and the tissues have been filled with oxygen by the air from the deep breaths that he has just taken. Deep breathing is very important. By doing this we can push the stagnant air out of the lungs. Our lungs are larger than are needed for everyday use. If this were not true, we should be unable to make any unusual exertion.

It has been proved that the overseers in Jack's brain judge by the quantity of carbon dioxide in the blood which passes through them. If it rises a little, then they hasten to deepen Jack's inspirations until its quantity falls. Their business is to keep the quantity of carbon dioxide in Jack's blood below danger point, and to this end they watch and direct, without a pause, from the first breath that he draws in his life to his last before its end.

WHAT HAPPENS IN THE CHEST WHEN WE BREATHE

The chief of the muscles through which they act is the great sheet of muscle stretched between Jack's middle story and his lower story. It is called the diaphragm, and when it gets orders to contract it flattens itself so as to make much more room in Jack's chest, or middle story. Jack could not live very long if his diaphragm stopped working, and it is helped by a large number of other muscles between his ribs. These and various other muscles all have the same action as the diaphragm —when they contract they draw the ribs outward and make the cavity of his chest much larger.

That happens when we work a pair of bellows, and the result is exactly the same. The chest is a pair of bellows, and when it is expanded air from outside rushes in. The air outside has a pressure called the "atmospheric pressure," and directly we create a vacuum, or empty space, in the lungs, no matter how small it is, the atmospheric pressure drives the air in to fill it. Some creatures force the air in by a force-pump action, just as Jack's pump forces his blood along; but we breathe by a suction-pump arrangement.

THE MILLIONS OF ELASTIC FIBRES WHICH STRETCH WHEN WE BREATHE

When the air has entered, and the chest is deepened and widened, its walls are all in a state of being stretched. The ribs are a little twisted, and the muscles are ready to return to their former shape. Further, the lungs themselves contain an enormous quantity of yellow elastic fibres, coiled up in millions and millions all through the lung substance or tissue, and when the lungs are stretched by the air, all these elastic fibres are stretched too, and ready to relax again. So, the instant the muscles of inspiration cease to pull, all these elastic things relax like a rubber that has been stretched, the chest comes back to its old size, the air is squeezed out, and that is how expiration happens. Of course, we can make "forced expirations" when we deliberately use muscles to contract the chest. We do so when we cough, or speak, or sing, or sneeze; but ordinary expiration uses no muscles at all.

Sometimes, when people are old, or take too little exercise, they lose the proper elasticity of muscles, ribs, and lungs, the lungs are never properly emptied, but remain over-stretched all the time; and all sorts of disasters follow.

HOW JILL SOMETIMES FAILS TO COPY JACK'S GOOD EXAMPLE

Breathing is so important that it is one of the things we all do quite naturally without being taught. Only sometimes we adopt foolish habits which interfere with it. Jack is not so bad an offender as Jill in this respect, for she sometimes packs her chest into clothes which prevent her diaphragm from moving and her lungs from filling properly. Nature meant every part of Jack's house to have free play for action, and if she had thought Jack would be better with a strait-jacket she would have made him one. If there is one part of his body more than another which should be perfectly free to move as it will, by day and night, it is the chest or thorax, which provides his every living cell with the air it breathes, and without which he cannot live.

CONTINUED ON PAGE 6353.

A life-saving dress in which submarine sailors can float to the surface.

DOWN IN THE DEEP, DEEP SEA

CONTINUED FROM 6270

IN the caverns deep of the ocean cold,
The diver is seeking a treasure of gold.

The bottom of the sea is rich in a harvest of sunken vessels and cargoes, and how can a diver seek this treasure? It is because he wears a sort of armor, which keeps out the water and brings him air from above. By the help of this armor he can also do much valuable work in constructing and repairing foundations under water.

The diver's suit of rubber covers his body from feet to neck, but leaves his hands free, as his sleeves end in water-tight cuffs at the wrist. He puts on a heavy helmet made of tinned copper, which fastens to the neck of his suit. There are three windows in this headpiece, of half-inch glass, secured in brass frames, and in addition to these there may be a window in the top of the helmet. There is a valve attached to a pipe, through which comes the air pumped from above. This valve is what is called a non-return and is very important, for if the air pipe is broken, the valve closes and gives a short time for the diver to realize his danger and act for safety. A second valve in the helmet lets out the air which has been breathed. Electric lamps and telephones are provided, so that not only has the diver the means of seeing around him, but he can communicate with those above him regarding his operations, and be communicated with. In order that he may sink down into the water, he wears extra weights of lead secured by hooks at the neck.

A recent invention provides him with what is called a ground block. This is a stand or anchor with steps cut in the side upon which he may ride down and up in comfort. Its purpose is to relieve the diver of the weight of his cable, which is attached to the block. When he reaches the bottom he can set up his anchor and fix his cable on a pulley so that he then only has to drag about with him the part between himself and the reel.

The deepest that a man has ever been known to dive is 306 feet, but men seldom go down more than 100 feet. The deeper down we go, the greater is the pressure of the air. A man who goes down sixty feet has to breathe air at twice the pressure of the ordinary atmosphere. The result is that the air taken into the blood is forced by the pressure into froth and bubbles, and some of the tissues of

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the body give off this air very slowly, so that if a man comes up suddenly, many of these bubbles remain in his blood. This may cause paralysis or death. To guard against this, a man must take a long time in coming up out of the water, resting at different depths, so that the bubbles may disappear. A time table for divers has been made so that they may know how to descend, and work and come up again with the greatest safety.

LIGHTENING THE DIVER'S LOAD

The diver often has to do heavy work in attaching cables and otherwise helping to recover wrecks and cargoes. He needs hammers, drills, scrapers and cutters. He needs some way of carrying these to the bottom of the sea, and of storing them while at work. For this a clever inventor has made a submarine air-room, which can be lowered to the sea bottom from the surface, with which it is connected by air-hose. It carries telephone cables and serves as the diver's base, instead of the ship. There he can keep his tools, and there he can retreat for safety from rapid currents or if anything goes wrong with his suit or connections. His own line runs horizontally from it, instead of vertically from the ship above, and is thus less liable to accident from currents. So many ships with valuable cargoes were sunk during the Great War that divers will be busy for many years seeking to recover the treasures.

HOW A DIVER CAN BE INDEPENDENT OF THE AIR-HOSE

Divers are carried by every man-of-war. If anything happens to the ship below the water-line, the men put on their dress, go down with tools, and repair the damage. One kind of diving suit has attached a cylinder of compressed air, and with this the diver is not encumbered with air-hose and cannot be suffocated by a kink in it caused by a current. To make his supply hold out for a long period of time he has an air purification circuit similar to the one described below.

Another invention, for submarine vessels, is a strong helmet and a water-tight jacket. In the jacket pocket is a substance called caustic soda or potash, which, on coming in contact with the sailor's warm breath, gives off oxygen, and so acts that the poisonous carbon dioxide from the man's breath is absorbed. By this means, the air inside the helmet and jacket can be breathed again and again. The submarine sailor, in case of accident, puts on this dress and floats to the surface, when the dress acts as a life-buoy, keeping its wearer afloat until he can be rescued.

A BRAVE DIVER WHO BEAT THE WORLD'S RECORD IN DIVING

In March, 1915, the submarine F 4, belonging to the United States Navy and carrying a crew of twenty-one men, disappeared in deep water off Honolulu. Divers at once went to the scene of the accident to locate the sunken boat, and thirteen descents were made, every one of which broke a world's record for deep sea diving. Five were made to a depth of 306 feet, and eight to 275 feet. The former world's record was 274 feet. And for the first time in the history of diving, a telephone device was used successfully in communicating with the men under water. At last the submarine was found —288 feet below the surface—with a hole in her side. The diver who discovered her was under water for two hours, five minutes for the descent, twelve minutes on the bottom and one hour and forty-five minutes in coming up.

It was decided to raise the submarine to the surface by attaching cables to her hull and gradually drawing her into shallower water, whence she could be raised. Every day, when the currents allowed, divers were busy fastening these cables. Again and again they had to be renewed, for the rapid currents parted them. One morning, after the work had been going on for about a fortnight, a diver went down and successfully accomplished his task. As he was being brought to the surface he became entangled in one of the lines attached to the underneath craft. He signaled to the ship above and another diver, Frank Crilley, who had already made a record, went down to his rescue. Both men worked strenuously to disengage the line to the submarine from the air tube and the line attached to Loughman's apparatus. After heroic efforts, lasting for four hours, the signal came for the final raising to the surface. With what a will those aboard the ship obeyed! Crilley came up first, and then Loughman, exhausted but otherwise unharmed.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 6357.

THE DIVER PREPARES TO GO DOWN

The diver's dress is the result of centuries of experiment, and enables a man to keep under water for five or six hours at a time. The dress consists of a waterproof garment, heavily weighted, massive, heavy boots with leaden soles, and a metal helmet. Here the divers are beginning to put on their costume.

After the diver has put on ordinary clothing, he is helped into a waterproof garment, which covers his whole body, except head and hands. He needs warm clothing, as it is cold working under water.

In this picture the diver has on the waterproof garment and the heavy boots. The rope by which he will be lowered is already round his waist, and he is about to have the helmet put on his head.

TALKING TO A MAN DOWN IN THE SEA

These pictures show a diver going down into the sea, and a man talking to him by telephone. The diver's helmet has three glass windows, and is fitted with valves, so the air he has breathed can escape. Fresh air is supplied through a tube that connects the helmet with an air-pump worked from above.

The diver's costume weighs about 150 pounds, but so buoyant is the water that he has to put his feet under the ladder rungs to pull himself down.

Communication is kept up by means of the telephone. One sailor is here seen speaking to the diver while the other is working the air-pump.

THE MEN ABOVE AND THE MAN BELOW

In this picture the diver is working under the sea, while in the ship above one man holds the rope by which he is raised, another has charge of the air-tube, and a third is telephoning to the diver. The greatest depth to which a diver has been known to descend is 306 feet, but divers can rarely work farther down than 100 feet. A complete diving costume, with all the necessary apparatus, costs several hundred dollars, but this is cheap, when we take into account the valuable work the diver does.

The photographs on these pages are by Stephen Cribb, and others.

THE DIVER COMES BACK TO THE BOAT

On this page we see how a diver works from a small boat. There is no telephone, and the diver communicates with those above by signaling with a rope. He can get to the place where he wishes to work either by descending a ladder that hangs over the side of the boat, or by being let down by a rope.

The diver is pulled to the surface by the rope round his body. The invention of diving apparatus has led to the recovery of a vast amount of treasure. From one ship alone that foundered in sixty feet of water, nearly $1,000,000 was recovered by the brave divers. In the latest kind of diving-dress the diver carries a cylinder of compressed air on his back, and is independent of help from above.

THE BELL THAT RINGS UNDER THE SEA

This shows the best means of warning a ship in foggy weather. By means of electricity, the lighthouse-keeper rings a bell under the sea. The ship has inside its hull on each side a microphone, which collects the sound of the bell as it passes through the water in the direction of the dotted line, and magnifies it. A wire connects each microphone with a telephone receiver in the wheel-house, and by turning his ship until he hears the bell equally loudly from each side, the captain is able to point his ship towards the bell. His chart marks the position of the bell, and he is thus able to know exactly where he is.

MAN'S BEST FRIEND AMID ETERNAL SNOWS

St. Bernard dogs rescuing exhausted travelers after a snowstorm in the Alps.

Eskimo dogs dragging a sledge over hillocks of ice.

Dogs of the Monastery of St. Bernard, famous for their heroism in rescuing travelers.

DOGS OF MANY DIFFERENT KINDS, SHAPES AND SIZES

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Different breeds of dogs vary more than horses or cattle. Some weigh only a few ounces while others are strong enough to kill a man. Some are useful because of their wonderful noses while others are valued only for pets.

Eskimo dogs, from the fine copyright painting by Miss Maud Earl of "The End of the Trail."

THE STORY OF YOUR DOG

CONTINUED FROM 6247

THE lover of the dog would be lost without the faithful creature which guards his home, or keeps him company on his walks. The dog is a very emblem of faithfulness. When it has become fond of a human being, nothing will change its feelings. Starvation and ill-treatment will not kill its devotion. It is almost more than human in its constancy. No matter how poor a man's home may be, his dog cheerfully stays with him, content with scanty food sweetened by a caress and a kind word now and then. Those who keep their dogs in luxury can hardly realize the intense devotion which the animal is capable of displaying when it is called upon to bear hardships and privation with its master and mistress. Dogs remember their friends for a long time, and will recognize them after an absence of years. They will often refuse to give their love to new owners and will pine away when sent among strangers, and they have been known to travel long distances through country unknown to them to find their way to their old homes.

Dogs were the first tame animals which man possessed. It is thousands and thousands of years since the children of the cave men and the lake dwellers of Europe tumbled about and played with the puppies whose descendants are our dog friends of to-day. Some of the races of dogs that we know are, we might say, almost as old as some of the races of man that now exist in the world. We know from the pictures on their ancient temples that the Egyptians hunted with greyhounds from very early times. The Assyrians had large dogs which tradition says the Phoenicians brought to Britain, and it is said that possibly the dogs whose pictures were carved by the Assyrians on their walls were the ancestors of the prize English mastiffs at an American dog show. Other people say that it was the Romans who introduced the mastiff to their colonies in Britain. Wolfhounds too were known from very early times. The Egyptians had them, and it is said that Irish chieftains owned the ancestors of the Irish wolfhound and Scotch deerhound when the Romans held Britain, while a Roman historian says the Roman soldiers used bloodhounds in their wars against the Gauls.

With the exception of the islands of Madagascar and New Zealand, and some of the Polynesian Islands, there is not a country in the world in which dogs have not been found, either as friends of the people who lived there, or, in a wild state, hunting for themselves in packs, as the wild dogs do in India. Perhaps, however, there is one

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other exception, for we cannot be sure that the wild dog of Australia, the dingo, was not brought to that continent centuries ago by the ancestors of the people whom the early English explorers and settlers found living there.

Ancient friendship between men and dogs

The friendship between men and dogs is so old, that it is no wonder that its beginning is lost in mystery. At first sight it looks as though they must be descended from wild dogs, such as those of which we have spoken, but this is not so. Learned men who know about these things say it is much more likely that the wild dogs are descended from tame dogs, that wandered away, just as the troops of horses on the Western plains came from tame horses that had escaped from the Spanish settlers, and gone wild.

Probably all our dogs, whether they are large or small, rough or smooth, whether they hunt for us, or guard our flocks or our houses, are descended from wolves and jackals. It is perhaps hard to believe that our faithful, loving, intelligent pets have come from fierce wolves or hungry jackals, but it is believed that they have.

If you were to go into a museum, and look at the skeletons of dogs and wolves and jackals, you could not tell one from the other, unless you had read the labels. Perhaps you have wondered why your favorite dog turns himself round and round before he curls himself up on his cushion or his rug to go to sleep. Next time you see your pet do this, you can remember that his wolf or jackal cousin does exactly the same thing when he is trying to find a comfortable resting place in his stony or grassy lair. Perhaps some of our dogs are descended from foxes, which also are included in the dog family, or they may have come from another wolf-like animal that has died out, but few people think that either of these suppositions is possible. It is generally believed that dogs as a separate race, as we know them, did not exist when man first appeared in the world.

How the friendship between men and dogs began

And now comes the question, how were the animals tamed from which our dogs are descended. As we have seen, ages of time have gone to make the friendship between men and dogs what it is to-day, and to look for its beginning we must go, in imagination, far back to the early history of the world, that we have only of late begun to dig out of the earth.

In early times, man was not a tiller of the ground. He did not sow grain, or plant vegetables. He learned in course of time that certain fruits, and berries and nuts were good for food, and as certain animals, which do not rank high in the scale of creation, have the sense to store food, we may imagine that man, even in the early dawning of his powers of mind, did something of the same sort. He did not, however, store up his food on any large or systematic scale. His storehouse, and his very home, might at any time be raided and seized by some one more powerful than himself, or his cave might be invaded by savage beasts. No man will lay up store for the future unless he can be reasonably sure that the store will remain safe to serve the purpose for which it is intended. All this makes it plain to us that man, in the early days, must have lived what we call a hand-to-mouth existence. For months in the year, when there was no vegetable food available for him, he was forced to eat animal food to keep him alive, and to use the skins of the animals that he killed, to keep him warm.

From the moment then that we find the first traces of man on the earth, he was a hunter. For long ages, there was war between him and the animals, and all the flesh-eating animals—the carnivorous animals—warred on him. Now among the flesh-eating animals are numbered all the members of the dog family. Except the fox, these animals, when they are pressed by hunger, hunt in packs, for so they are able to attack large game, and pull down animals much larger than themselves. Man cannot be classed among the large animals, but the wolves soon found that he could easily outwit a single animal. Still, many a man fell before the combined onslaught of the pack, and numbers were killed, as they are still killed in Russia, and in the wild parts of our own continent and of Asia.

But man was more clever than any of the beasts. Though he had only two legs, and could not equal his four-footed enemies in speed, he had the advantage of having two hands free. He quickly learned not only to use the weapons that nature left ready to his hand, but to manufacture new ones. He could throw

a club, or a roughly made spear. He could gather up large stones, and throw them at his pursuers and kill them. That marked him off from the rest of creation. Other animals had to approach and make a close attack upon their prey. Man could stand and hurl a weapon at whatever he wanted to kill.

He probably soon noticed too that the animals that provided for him the best food, were the vegetable-eating animals, and unless they molested him, he let the carnivorous animals alone. But the animals that man slew for food were just the animals upon which the dog family themselves depended for food. Man left large portions of the flesh and bones of his prey upon which these animals could feast, and they could rob him of even the portions that he had hidden from them, just as wolves rob caches made in our own time by travelers in the wild.

THE FIRST PARENTS OF OUR PETS

But man could combine, too, and when the depredations of the wolves and jackals became too bold, probably our wild ancestors banded together, tracked them to their lairs, and killed, or drove them off. Among them, however, there were sure to be young animals, and some of these the cave men probably brought back to their rude dwellings. Probably, even if they objected to the flesh of grown wolves the young animals provided food to their liking. But we may imagine the cave children commencing to play with the little dog-like animal that the men had brought home, and begging to keep it. Then the children, as children will, divided their food with their new playmates. Every one who has much to do with dogs, knows what a difference kindness shown to them in their puppy days makes in their dispositions, so the young wolves or jackals, or perhaps both, grew to love their masters, and later on helped them to hunt. Then seeing their usefulness, the cave men caught more young animals, or, when they drove away wolves or jackals from a good cave in which they wished to live, they kept the young animals. By and by these tame wolves and jackals brought up families of their own. We know from experience in how short a time what we call a new breed of dog appears. For instance, the black retriever is descended from the black Newfoundland and the setter; and the tiny toy dogs that we see carried about in ladies' arms have been brought into the world by selecting for generations the very smallest Pekingese, Japanese, Pomeranian, or other kinds of dogs. So it is likely that the families of tame wolves and jackals quickly changed their form, and with every generation they grew further and further away from their savage cousins of the woods or plains.

Soon a strong friendship grew between man and dogs, and a kind of partnership was made between them. The dog hunted for man, and man killed the game, fed the dog and provided it with a warm shelter.

THE SHEEP-DOG AND ITS CLEVER WORK

The friendship that grew up between men and dogs still exists, and the companionship between them is closer than ever. As civilization advanced, however, and man became independent of hunting, he became less dependent on the dog for aid. Nevertheless, in many countries, away from towns and cities, the old partnership between men and dogs exists in something like its ancient form. The shepherd who watches his flocks upon the mountains would be helpless without his partner. The sheep-dog knows its master's sheep as well as the shepherd, perhaps better than he. It will fetch a lamb out of a strange flock, and restore it to its master's fold. It will collect sheep that have scattered and strayed upon a hill in the mist; it will drive home, unharmed, the lost lamb, the sheep which has been frightened away from the flock.

Other dogs which work for their living are the pointer and the setter, the retriever, the terrier, and the foxhound.

But it is the sheep-dog that we single out as the best representative of the working dog to-day. Wherever the sheep-dog is at work, observers notice that it takes itself very seriously. It loves the shepherd, but it seems to regard its work as of first importance.

There are many different kinds of sheep-dogs, some long-haired like the Scotch collie, with its beautiful silky coat, and long brush-like tail, and some with a rough, shaggy coat like the old English sheep-dog.

Indeed every country may be said to have its own sheep-dog, of which it is exceedingly proud, and with reason, for sheep-dogs are the most intelligent of all

dogs. Probably they are descended from dogs which were first used merely to guard the flock and chase away wild beasts. Only the wisest puppies of these dogs were kept; and in course of time they learned to round up and help to bring home the flocks and herds. Faithful friends and wise and loving companions though they are, we are almost tempted to say that it is cruel to keep sheep-dogs in a city. People who have only seen them trotting along at their owner's heels or running about with muzzles on have no idea of their capabilities. It is a beautiful thing to see a well-trained, fleet-footed sheep-dog at work with its master. It watches every motion of his hand, heeds every tone in his voice or even the sound of his whistle, and quickly and silently gathers in the flock or herd with only now and then a short, sharp bark to impress upon a laggard the need for speed.

THE INTELLIGENT DOGS OWNED BY SIBERIAN SAMOYEDES

The dogs used by the Samoyedes may be classed among the sheep-dogs, for though the Samoyede tribesmen have no sheep in their Siberian home, they use their silvery white dogs to help them to look after their great herds of reindeer. But the usefulness of these wise little beasts does not end with guarding the herds. They find out fords in the rivers for their masters, tow boats along the streams in summer and sledges over the snowy ground in winter, and hunt seals and bears and wild geese. One peculiarity about these dogs is that from among the pack they seem to elect one dog who acts as its leader and chieftain.

Many instances are told of the faithfulness of sheep-dogs to their trust, but we have room for only one or two.

Not very long ago an American shepherd died, and was not found for two days. The dogs went on with the flocks; they drove them gently forward up to the high-lying feeding lands to which they were intended to go, stayed with them, then turned them homewards. Of this faithfulness there is a more charming example, with which many are familiar.

Hogg, the Scottish poet-shepherd, had a fine sheep-dog. One day a great snowstorm swept down over the moors where Hogg's sheep were pastured. Hogg called up the dog, and sent it off in one direction, while he himself took an opposite route. Late at night Hogg returned with his half of the flock, but could see no sign of the dog. Long and anxiously he awaited its return. At last there came a gentle scratching at the door, accompanied by a low whine. He opened the door, and saw all his sheep safe and the dog standing there with a tiny puppy in its mouth. It placed the puppy at its master's feet, then raced off into the snow, soon returning with a second puppy, which, like the other, had been born out in the snow. The faithful creature had gathered the sheep and brought them home, but it had brought home also its puppies, as if to beg from its master the protection it was itself unable to give.

THE FRIEND OF ALPINE TRAVELERS

That is the stage to which the partnership between man and his best animal friend has come. But there is other work than sheep-minding for the dog to do. How many lives have the mighty St. Bernards saved up in the Alps? They are trained by the kind-hearted monks to go out on to the snow-covered mountains, and to find travelers who have become exhausted by the cold. The dogs call assistance by their barking. They themselves carry a little barrel slung round their necks containing refreshments. One of these dogs, a noble creature called Barry, saved the lives of forty persons lost in the snow. He found a little child lying in the snow under the influence of that fatal drowsiness. The dog roused the little sleeper by licking its face, then, lying down, allowed the child to climb upon its back, and so carried the little wayfarer in safety to the monastery.

Dogs such as Barry are big and strong enough to kill the people whom they save, and it must have been a timid person, fearing that Barry had some such intention, who caused the animal's death, for one day this grand old dog was killed. A pathetic inscription is set up over his grave: "Barry, the heroic. Saved the lives of forty persons, and was killed by the forty-first." There is not now so much need for the St. Bernards, for the railway carries people so easily through the mountains that few run the risk of crossing through the pass in autumn or winter weather. But they are still faithful to their task, and many a wayfarer owes his life to their care.

THE OLD SHEPHERD'S LAST FRIEND

THE DEAD SHEPHERD AND HIS DOGS, FROM THE PAINTING BY HENRY H. EMMERSON

THE OLD SHEPHERD'S CHIEF MOURNER, FROM PAINTING BY SIR EDWIN LANDSEER

FAITHFUL DOG AT HIS MASTER'S GRAVE, FROM PAINTING BY SIR EDWIN LANDSEER

THE DOG USED AS A BEAST OF BURDEN

When primitive men first began to make tools, and with them to model contrivances with which they could carry things, doubtless ice-sledges, to which they could harness dogs, were among the first conveyances that they fashioned. This is suggested by the fact that the Eskimos have used dogs as beasts of burden ever since they have been known to travelers.

The Eskimo dog is the animal which shows us most clearly what our own dogs used to be like. It matters not where you find him—in Arctic America, in Siberia, in Kamchatka—he is always the same, a sort of moderately tame wolf. When at liberty he mixes with wolves, if there be wolves about, and in a pack of Eskimo dogs in Arctic America there is almost certain to be as much of the wild wolf as of the true Eskimo dog. In these far northern regions we get a glimpse of the way in which our ancestors and the dogs' ancestors got on together. The Eskimos must have dogs to enable them to move their encampments from place to place. But when the day's work is done the dogs become simply wild animals. They get a few mouthfuls of fish for their wages, take a gulp or two of snow, and that is their supper; they will get nothing more from their master until the morrow, when another piece of fish will be thrown to them. They must hunt for themselves if they need more. And they do hunt, with the result that it is impossible to keep sheep, or goats, or birds where these dogs are. They kill and eat anything, and fight among themselves with terrible ferocity. Doctor Nansen, when he was exploring in the Arctic regions, lost several of his dogs from this cause. When they were liberated at night they would start a quarrel, and every one of the pack would turn upon the dog which seemed to be getting the worst of the battle, and kill it.

Although they are quarrelsome, however, Eskimo dogs are faithful to their masters, and in intelligence they are not very far behind the sheep-dog.

THE AID GIVEN BY DOGS IN TIME OF WAR

After the Great War began teams of Alaskan "malamutes" were sent to the Vosges Mountains to help to bring food and ammunition during the winter months to the French army at the front, and a French writer says that nine of these dogs could easily draw over a bad road, loads that would tire six horses on a good road. One of the teams was employed in a part of the mountains where they had each day to travel round a mountain. This went on for some time, and then one day the dogs themselves suddenly turned into a short cut, of the existence of which their leaders had not had the least suspicion.

Dogs are used in many ways in war time. They are used in Belgium and Holland to draw light guns over the sand dunes; but this is only a small part of their usefulness. They are the most watchful sentinels, and are trained to give notice without barking of a surprise attack; they carry messages from place to place, and will even deliver a message to the man they are ordered to find; they draw small ambulances, and above all they seek out and bring help to badly wounded men whom otherwise the Red Cross workers might never be able to find.

Special kinds of dogs, like the dogs used to draw the Belgian milk carts, are used to draw the guns, but sheep-dogs, because of their faithfulness and intelligence, make the best Red Cross dogs. Airedale terriers, too, make excellent war dogs, and this brings us to another ancient kind of dog—the terrier. Terrier means "earth dog," and for centuries terriers have been used to follow the fox, the otter and other burrowing animals into their homes and drag them out, or else keep them from escaping until the hunters can dig down to the burrow. There are many varieties of terriers, of which the best known, perhaps, are the fox terrier, the black and tan, the Airedale, the Irish, the Scotch, the Skye, the Dandie Dinmont and the Yorkshire. Some of them are rough haired, some smooth. Some are very small, some, like the Airedale, are of a good size; but they are all brave, intelligent little animals, and faithful, loving companions.

THE MANY DIFFERENT VARIETIES OF DOGS

There are so many varieties of dogs that it is difficult to speak of them all. Hunting dogs, or hounds, alone give us many varieties; but they may be divided into two large classes: dogs who hunt by sight or rely on their swiftness to catch their prey, like the greyhound, and the wolf and deerhounds, and dogs that tire-

MANY MEMBERS OF ONE GREAT FAMILY

These pictures of prize dogs give some idea of the astonishing variety in the dog family.

lessly run down their quarry by scent alone, like the foxhound, the beagle, and the bloodhound. These dogs like to hunt in packs, and their bark has a deep baying sound. Bloodhounds, which have been known since the time of the Romans, have an especially keen sense of smell. They have often been used to track slaves and criminals, and many a lost child has owed its safety to the tireless tracking of a faithful hound. Bloodhounds are naturally gentle, peaceful animals, but can be trained into great fierceness. Greyhounds are smooth coated, but deerhounds usually have rough coats, and the

Belgian Milk-sellers with their picturesque Dog-carts.

borzoi, or Russian wolfhound, has long, silky hair.

The long legs of the greyhound family, and their slim bodies, enable them to run with great speed, and to make long leaps. One beautiful borzoi that we knew could leap seventeen feet at a bound, and has been known to pass a runaway horse.

Several kinds of dogs have been trained to help the police in large cities. This is done chiefly in the European cities; but a beginning has been made in some of the cities of this continent.

How Dogs Help the Sportsmen

Dogs like the hounds, of which we have spoken, and setters, pointers, spaniels, terriers and retrievers, are called sporting dogs. It would take too long to tell how the special races of dogs came into existence. They are all clever, and easily trained by kindness. Setters, pointers, and retrievers, like the dogs of old time, find the game that their masters have shot. When it has found the wounded bird or animal the setter sits down and waits for its master to come up, the pointer stands quivering, with nose pointed straight toward the game, and tail outstretched, but the retriever, cleverest of all, fetches the game from the place where it has fallen. This writer's mother owned a large black retriever that would swim out into the water, take a wounded bird in his mouth, swim back with it, and lay it gently at his master's feet without having hurt a feather. Retrievers are very intelligent, and quickly learn to obey commands, and remember what they are forbidden to do.

This same dog, when he was a puppy, tried to follow his mistress to church one day. When she reached the gate, she sternly told him to go home, and closed it. He looked at her beseechingly, then turned and soberly trotted homeward, and though he lived to be old and gray, and was her constant companion in her walks, he never again attempted to follow her on Sunday morning. Nor did he ever attempt to follow the children to school, though he was always their playmate and protector when they roamed in the fields

SPECIMENS OF THE MOST USEFUL BREEDS OF DOGS

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This page shows several useful dogs. Pointers and setters hunt birds, collies guard sheep, and the greyhound is used in the chase. Eskimo dogs are beasts of burden, and all of you have read of St. Bernards and Newfoundlands.

and woods around their home. Once this dog was taken a long distance to a shooting party, and did his work so beautifully that the host at the party begged to be allowed to keep him for a few days longer. Next day the man who borrowed him telegraphed in great distress. The dog was lost, and could nowhere be found. There was great mourning and indignation in the family when the news was told to the children, but in the morning, the household was awakened by a dog's loud barking. Dash had come home, and was announcing the fact with all his might. Afterward his homeward course was traced, and it was found that he had come fifty miles, straight across the country from a place to which he had been taken a roundabout way by train.

All dogs, whether they hunt for their masters, or help him to find the animals he has killed, or safeguard his flocks and herds, or, like the mastiff and the bulldog, watch and guard his property, may be called friends of man. It does not matter whether it is a poodle whose grandfathers and grandmothers have had their names in the dogs' "Who's Who" for many generations, or a Pekingese whose ancestors lived in Chinese palaces for centuries, perhaps, or only a mongrel whose origin no one knows, a faithful dog will cling to his master till death.

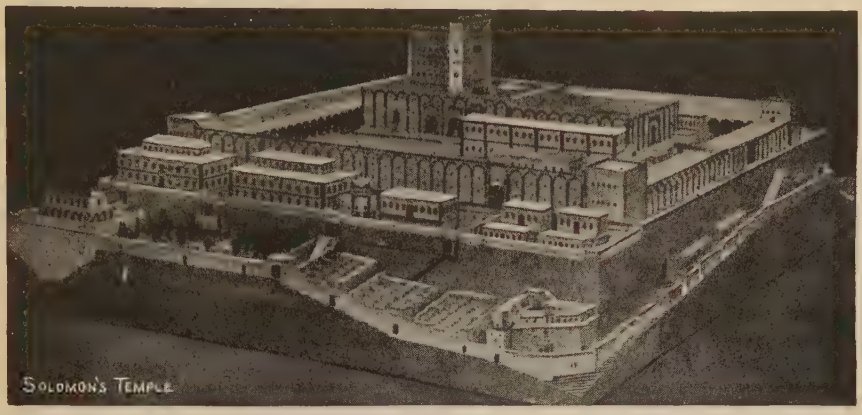
"Dignity and Impudence," from the Painting by Sir Edwin Landseer.

THE NEXT NATURE STORY IS ON PAGE 6371.

HANNAH DELIVERS SAMUEL TO ELI

Hannah had vowed if God would give her a son she would give him to His service. Her prayer was answered. The good woman remembered her vow, and as soon as she was able she brought the infant, whom she had named Samuel, to the old priest, Eli, and gave him up to the service of the Tabernacle.

This beautiful picture is from the painting by Mr. F. W. W. Topham


SOLOMON'S TEMPLE

THE SCATTERED NATION

CONTINUED FROM 6229

THE "Book of All Countries" has now described the principal countries of the world and the people who live in them. We have read of England and the English, France and the French, of Russia and the Russians—to name only a few—and given pages of text and pictures to many very small countries with few inhabitants. Yet we have omitted one of the most important and influential peoples of the world.

We cannot find their state on the map, for they have no separate country of their own, but are scattered over the whole world. They are to be found on every continent and in almost every country. In America they are Americans; in England they are English; in the German Empire they are Germans, and yet they have not been swallowed up in these great nations.

Usually when people come to live in a country, their children intermarry with the natives of the country or with other immigrants and in a few generations the original blood can hardly be traced. Many American citizens can find among their ancestors, Englishmen, Frenchmen, Germans, Irishmen or Scotchmen who came here years ago. The people of whom we speak have not been lost in this way, but are yet distinct. Still, some of them are among the best citizens of the countries in which they live.

Who are these people and where do they come from? They are the Hebrews, commonly called the Jews, and their story is perhaps the most wonderful in all history. There is no other tale like theirs. If you will turn to the map on page 3857 and will get your Bible, we shall soon find out some things about them. Here is the beginning of the story as told in the Bible.

THE BEGINNING OF THE HEBREW PEOPLE

Long, long ago, around a city called Ur of the Chaldees, some of the descendants of Noah lived. Among them were Abram, and his wife, Sarai. Though they had great flocks and herds they were sad, for they had no child. The Lord appeared to Abram and told him to go away from his country into the land of Canaan and promised that he would make of his descendants a great nation.

Abram obeyed and removed to the country we now call Palestine. We cannot tell here all the occurrences, but you can find the story in the Old Testament. Abram was promised a son and told to call himself Abraham and his wife Sarah. The son was born and called Isaac. He married his

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cousin Rebecca and they had two sons, Esau and Jacob, later called Israel. The latter secured the greater part of his father's property by a trick, and married his two cousins, Leah and Rachel. He had twelve sons. One of these, Joseph, his father's favorite, was sold into Egypt as a slave by his jealous brothers, who did not like the way their father favored him; and there, because of his wisdom, he finally became First Minister and the real ruler of Egypt. After a time, because of famine, Jacob and all his sons and their families were moved to Egypt, where land was given them, and where they increased greatly in numbers.

Years afterward, the Egyptians became jealous of them. The rulers inflicted many hardships upon them, though they would not let them go out of the land. At last a great leader, called Moses, arose, and the children of Israel determined to leave Egypt and seek the land promised to Abraham. Finally they were allowed to go, and left Egypt, but for forty years remained in the Wilderness between Egypt and Palestine, where the Lord appeared several times to Moses and gave him laws for the people. The Bible says that the Ten Commandments were given to Moses in this way.

How the children of Israel came to the promised land

After the death of Moses, a brave and skilful general, named Joshua, led them into the "Promised Land," where they contended for possession with the heathen tribes, sometimes conquering, sometimes losing, but always increasing in numbers. A tabernacle for worship was set up and priests were chosen to offer the sacrifices. To this period belonged Gideon, Samson and the prophet Samuel. After a time they decided that they must have a king, and Saul was chosen. One of Saul's lieutenants was a young man, David, who had become prominent because, while a young shepherd boy, he had succeeded in killing with a sling and a stone the great champion of the Philistines called Goliath.

Saul became jealous of David and several times sought his life. Finally David and some companions rose in rebellion against Saul and were able to conquer part of his territories. Saul and his sons were slain in a great battle with the Philistines, and soon after David became king of Israel. There was much fierce fighting for a time, but at length the heathen tribes were forced to obey and the kingdom grew more powerful.

Solomon, the wise king who built the temple

Many interesting events occurred during David's reign, but we cannot stop to tell them now,—not even the sad story of Absalom, his favorite son, who rebelled. At the death of David, his son Solomon became king, and under him the kingdom reached its greatest wealth and power. He built at Jerusalem a magnificent temple for the worship of the Lord; he sent ships to every port of the known world, and built great public works. The fame of his wisdom reached the ears of far-away rulers, who came to talk with him.

All of Solomon's great works cost much money, however, and at his death the people hoped that their taxes might be lightened. Solomon's son, Rehoboam, who succeeded him, was a proud and arrogant young man with high ideas of the power of a king, and threatened to make their lot harder. Under Jeroboam, the northern part of the kingdom revolted and became the independent kingdom of Israel, leaving only the southern part, including Jerusalem, called the kingdom of Judah, faithful to Rehoboam. This division took place, as we count time, somewhere between 975 B. C. and 930 B. C., that is, between twenty-eight hundred and twenty-nine hundred years ago.

The fall of the northern kingdom of Israel

For about two hundred and fifty years, the story of the two kingdoms is not a happy one. Many of the rulers were bad, some were idolaters, and there was much fighting. Sometimes the two little kingdoms were at war with each other and sometimes with the stronger nations about them. Egypt and Assyria at times demanded tribute, and finally, about 721 B. C., Sargon, who had been a general of Shalmaneser, ruler of Assyria, and who succeeded him, captured Samaria, the capital of the northern kingdom, and carried away many of the inhabitants to his own country, though some were allowed to remain.

What became of those who were carried away, no one can say, though some men have tried to prove many curious things. Some have said that these "Ten Lost Tribes of Israel" somehow came to America and became the ancestors of

WHERE THE GREAT TEMPLE OF SOLOMON STOOD

Solomon built a strong foundation for the temple on Mt. Moriah. Now the spot is occupied by a magnificent Mohammedan mosque, shown in the centre of the picture. Other smaller mosques stand on the great raised platform. Ruins of the great castle built by the later kings may also be seen in the neighborhood.

To this part of the great foundation wall of the platform built for the temple, the Jews living in Jerusalem come every Friday to mourn the departed grandeur of their holy city. Nearly two-thirds of the inhabitants of Jerusalem are Jews, but the government was for hundreds of years entirely in the hands of the Turks.

our Indians; some have thought that perhaps the Japanese are their descendants; some have thought that the Irish come from them; and many other theories just as absurd have been taught. It is probable that, in their scattered state, they mingled with the people with whom they lived and finally lost their religion and forgot their ancestors. Their lands were taken by colonists sent out from Assyria.

THE SOUTHERN KINGDOM IS FINALLY DESTROYED

The kingdom of Judah endured for more than a hundred years longer, though for a time it was dependent upon Assyria and then upon Egypt. Some of the rulers were bad men and the people often fell into the worship of the heathen idols such as Baal and Ashtoreth. One great king, Josiah, restored the temple, and for a time things were more hopeful. The prophet Jeremiah, however, said that trouble was coming and warned the people to repent thoroughly of all their sins. Finally, about 606 B. C., Nebuchadnezzar, king of Babylon, which was now the great power in the East, conquered the country, though he allowed the king to remain as his vassal. Many of the wiser Jews, among them the great Daniel, were sent to Babylon to serve the king. Soon the people revolted, and in 586 B. C. Jerusalem was captured and many of the inhabitants were taken to Babylon. The governor whom Nebuchadnezzar had left in charge was killed by a member of the old royal family and many of the remaining Jews fled to Egypt.

EZRA AND NEHEMIAH TRY TO BUILD UP THE KINGDOM AGAIN

In Babylon many of the Jews became important people, and after Cyrus, King of Persia, had conquered the city, he was persuaded to send those Jews who wished to return, to Jerusalem. This was 536 B. C., seventy years after the city had been taken. Later another large company, under Ezra, returned to their old home and soon Nehemiah, a pious Jew, but a favorite of the Persian king, was made governor. Esther, a young Jewess, even became the wife of a later Persian king.

Then for a long period the little province was tossed back and forth among the kings who rose to power. It was taken by Alexander the Great, who granted the inhabitants many privileges. After his death, when his great empire had fallen apart, hapless Judæa was a cause of quarrel between Egypt and Syria, for more than a hundred years. Many Jews went to Egypt to live, and some rose to high position. From the time that Joseph went down into Egypt there had been much intercourse with the Egyptians, and many traders passed back and forth.

Finally Judæa fell into the hands of Antiochus of Syria, who massacred many of the inhabitants and sold others as slaves, and defiled the temple. Their persecution became more than they could bear, and under Judas Maccabeus, a wonderful general, they almost freed their country from foreign tyrants. Unfortunately he was killed in battle, and the work was completed by Simon, his brother, and in 141 B. C. Judæa again became independent. For a time there was peace and prosperity, but divisions arose, and the great Pompey, of whom you may have read in the history of Rome, captured Jerusalem and carried many Jews to Rome. When Pompey fell before the power of Julius Caesar, the latter made the Idumæan Antipater, a foreigner, ruler. Then his son Herod became "King of the Jews" by the vote of the Roman Senate.

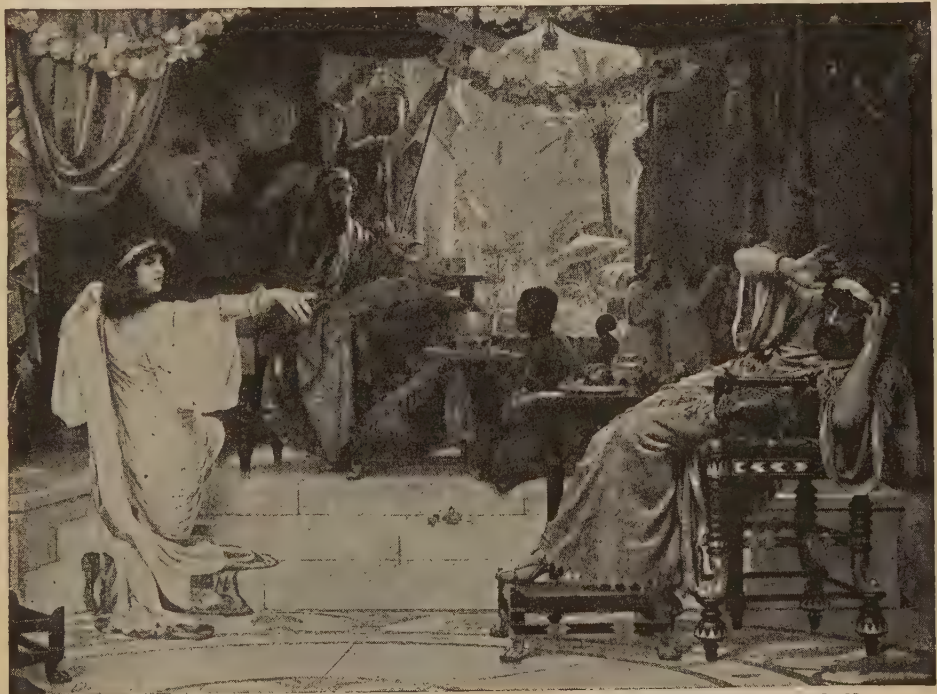
HEROD, THE GREAT KING OF THE JEWS

His rule was hateful to the Jews, even though he married a princess of the old line, but his strong arm and great ability enabled him to maintain his power in spite of all his enemies who carried many complaints about him to Rome. When his troubled, stormy life was over, by his will he divided his kingdom among three of his sons. The one to whom Judæa was given was hateful to the people and the Romans took control, though Herod's descendants had a shadowy rule over some of the provinces for a hundred years longer.

During Herod's reign, Jesus was born in Bethlehem, and under the Roman governor, Pontius Pilate, was put to death, but his disciples preached his doctrines and slowly his followers grew in number. At first they came from the Jews, but after Paul became so prominent among them, they admitted outsiders (Gentiles they called them). Fierce disputes between the Jews and the new sect arose, some of the Roman rulers were tyrants, and in the year 66 A. D. the Jewish war broke out.

HAMAN MEETS HIS DOOM AT A FEAST

MORDECAI AT THE KING'S GATE REFUSES TO DO HONOR TO HAMAN



ESTHER INVITES THE KING TO A FEAST AND DENOUNCES HAMAN

Because he hated Mordecai, the Jew who sat at the king's gate, Haman plotted to destroy all the Jews in the kingdom of Ahasuerus, whose Prime Minister he was. Queen Esther, who belonged to the Jewish race, and had been brought up by Mordecai, heard of the plot of Haman and invited him to a royal feast. Haman went to the banquet, but first of all built a high gallows, meaning to ask the king to hang Mordecai upon it; but at the feast the queen denounced the Minister before the king, who ordered Haman to be hanged on the gallows he had prepared for Mordecai. Mordecai took the place of his old enemy, and so was able to protect his people.

JERUSALEM IS DESTROYED BY THE ROMAN POWER AFTER A FIGHT

The Roman emperor, Nero, sent his best general, Vespasian, to put down the rebellion. Terrible fighting followed, but before Jerusalem had fallen, Vespasian became emperor and left his son, Titus, to complete the work. Titus closed around the doomed city, but its defenders fought desperately. There was no food, the soldiers on the wall were so weak from hunger that they could hardly stand. All, men, women and children, struggled to keep out the invaders, but finally the walls were broken down, the Roman soldiers entered, the temple was destroyed and the captives who were left alive were sold as slaves. This was in the year 70 A. D.

JUDÆA DESTROYED BUT MAY RISE AGAIN

Thus perished Judæa and it has never been restored. The Roman Empire was divided, and became weak, and the land has been held since first by the Persians, and then by Arabs and Turks. During the Crusades it was for a little while ruled by Christian princes, but the Turks soon regained control. In 1917, during the Great War, Jerusalem was captured by the English, and many Jews hope that a Jewish state will again be set up after the centuries that have passed since it was destroyed.

Other countries have gone in much the same way. Assyria, Chaldea, Babylon are now but names. All that is left of them is contained in a few records which the wise men try to read. Their people were swallowed up and soon forgot the glories of the past.

WHY HAVE NOT THE JEWS DISAPPEARED AS A PEOPLE?

Here is the strange, the wonderful difference between Judæa and all the rest. The kingdom of Judæa was destroyed, but the Jews are a vital force to this day. Never in history have there been so many of them, never have they been so influential and so powerful as to-day. What is the reason for this marvelous difference?

Some wise Jews say that the long captivity in Babylon is partly responsible. Before this time they had often forgotten the Lord and turned aside after strange gods; they forgot the Law of Moses, and neglected their religious duties. In Babylon they were in a strange land. Though many succeeded in business and others held high places in the state, they felt that they were strangers. Their religion, the fact that they were Jews, the "chosen people," became more and more important. They thought about it, talked about it, and the feeling grew stronger. The rules of conduct grew stricter and they took a pride in obeying them. Learned men discussed the Law, "The Torah," and the interest in all the sayings of the great teachers became intense.

Not all the Jews in Babylon returned to Jerusalem: many remained there, and as business called them, traveled to different cities and settled there. What is known as the "Dispersion," that is, the scattering, began, and has never ceased to this day.

HOW THE JEWS WERE SCATTERED OVER THE WORLD

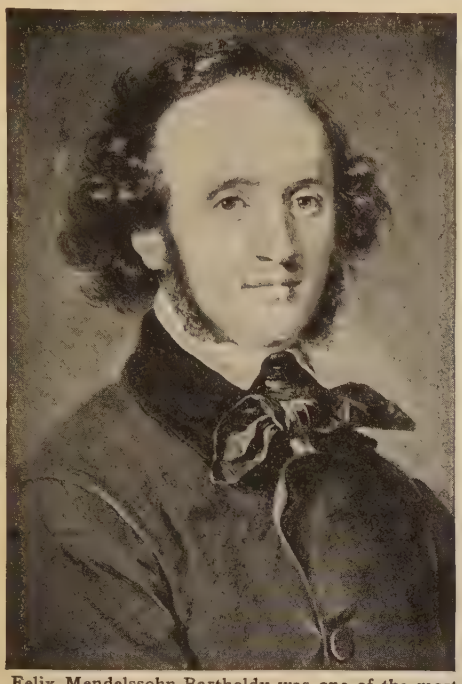
After Jerusalem was destroyed by Titus, most of the inhabitants were taken by their new masters to Italy or to the Roman colonies in France and Spain. Permission was given, however, to a famous rabbi or teacher, Johanan ben Zakkai, to open a school at Jabné, or Jamnia. From this school went out many teachers, all of whom worked to make all Jews feel that nation and religion were one, that all were brothers no matter how widely scattered. There were other schools at Babylon and Alexandria, for example, and all did their work well.

They did not give up their hope of again gaining Jerusalem, and several times strove fiercely in arms against the Roman power, which did not at first treat them so harshly as might have been expected. When Christianity became the state religion of the Roman Empire under Constantine, as you may read elsewhere, their lot became harder, except as their wealth protected them. The Mohammedan power was generally friendly, and in Spain they became very important. Jewish physicians were believed to be the most skilful, Jewish traders and bankers were the favorites at many courts, and Jewish scholars and teachers were the companions of the wisest. Finally, however, they were forced to become Christians or else leave Spain.

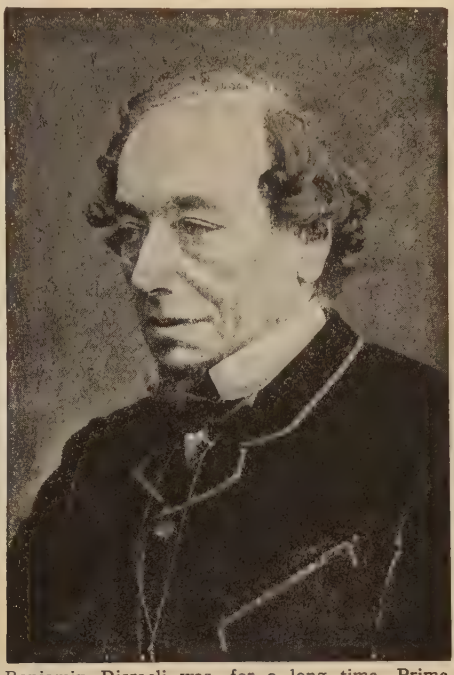
THE TALMUD, WHICH GUIDES JEWISH LIFE

When they were forced to leave Spain and Portugal, they went to Holland, Italy or Turkey. For a time the princes of Germany protected them, but as persecu-

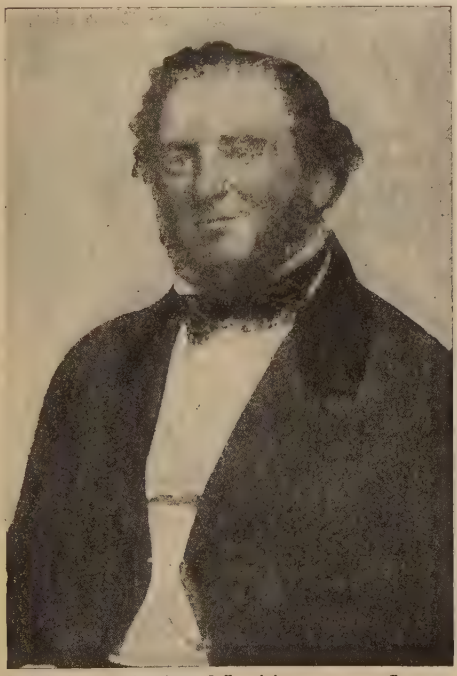
FOUR WORLD-FAMOUS JEWS



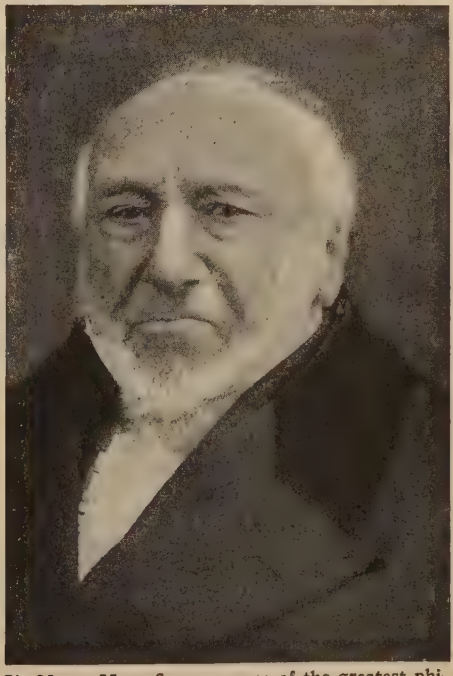
Felix Mendelssohn-Bartholdy was one of the most popular musicians of his time, and his compositions are still much admired. He was a grandson of Moses Mendelssohn, the great reformer.



Benjamin Disraeli was, for a long time, Prime Minister of Great Britain and was raised to the peerage as Lord Beaconsfield. He also wrote many novels and was a brilliant talker.



Judah P. Benjamin, of Louisiana, was a Senator of the United States, and then a member of the Confederate States Cabinet. After the Civil War he went to England and became one of the most successful lawyers in London.



Sir Moses Montefiore was one of the greatest philanthropists the world has ever known. He used much of his great wealth for those less fortunate than himself, but always gave wisely. Evidences of his generous gifts are seen in every country.

tion grew harder, many went to Poland, which was most liberal in its treatment of them though even there they suffered much. Their sufferings, however, only made them cling more closely to the Law, and the explanations of it, comprised in their sacred book called the "Talmud." Many studied nothing else, just as some Christians have said that it is useless to have any knowledge not contained in the Bible, and strict Mohammedans refuse to study any other book than the Koran.

During the Middle Ages the lot of the Jew was very hard, but as men have grown wiser they have recognized the fact that it is both foolish and wrong to persecute a man for his religious beliefs. In the most enlightened countries the laws which were unfair to the Jews have nearly all been repealed. In all English-speaking countries they have equal rights with all other citizens.

How some countries still persecute the Jews

In Russia, however, which has included much of the old kingdom of Poland, where there are more Jews than anywhere else, conditions have been very little better than they were in all Europe five hundred years ago. They have not been secure in the possession of their property, right of travel and settlement except in certain localities has been denied them, and only a small number have been allowed to attend the schools. We shall all watch with interest to see what the new governments of Russia will do for the Jews.

It is a general rule that the more backward a country is in civilization, the more harshly it treats the Jews, or, for that matter, the stranger within its territories. Those countries which are free themselves are willing for others to be free. So it is the states of Eastern Europe, which have had tyrannical governments, which show the most harshness.

During the Middle Ages and afterward the Jews were often forced to live in a particular neighborhood and to wear a special dress or, at least, a yellow badge, so that they might be recognized at once. All of this had its effect upon them, and we cannot wonder that their eyes were always turned backward, and that they lived in the past. One great man, Moses Mendelssohn, is given the chief credit of waking his fellows from their slumber. By his writings, his addresses and his personal influence he started a movement which has made the Jew a citizen of the world.

For a long time all the Jews observed the Law very strictly, though there were some differences among the different sects. After Moses Mendelssohn, however, a party known as the "Reformed" Jews arose. These say that all the different points in the Law do not fit modern life, and so they have omitted many of the ceremonies which the "Orthodox" Jews observe. They cling, however, to the principal things, and have many synagogues in the principal cities of Europe and America. There are also "Conservative" Jews who take a middle course.

What some of the European Jews have done

To name the great men and women of Jewish blood who have accomplished so much would take a long time and occupy many pages of our book. Therefore we can name only a few, not always the greatest, but some of the most interesting.

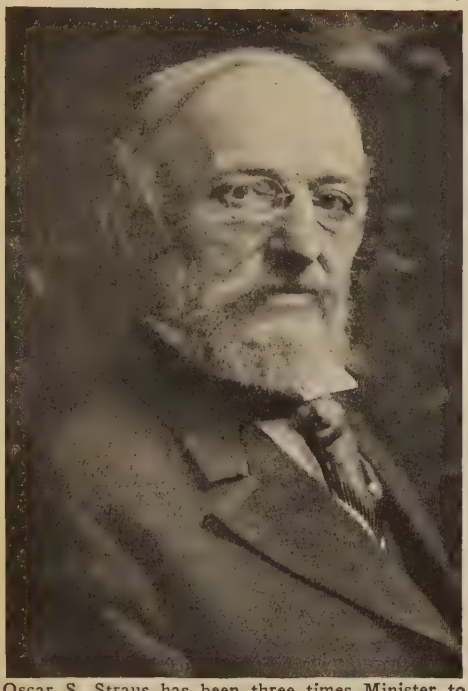
Music is an art in which those of Jewish blood have been prominent. Mendelssohn-Bartholdy, who wrote the "Wedding March" so often played, was the grandson of Moses Mendelssohn, mentioned above. Rubenstein, the great pianist, Meyerbeer and Offenbach, the composers, and Joachim, the violinist, as well as hundreds of other composers, performers and singers, have shown the Jewish talent in this art. Two of the greatest actresses of Europe, Sarah Bernhardt and Rachel, were both born Jews, and many artists are of the same race.

In France and Italy Jews have been ministers of state, but the most interesting of all was Benjamin Disraeli, afterward Lord Beaconsfield, who rose to be Prime Minister of England. Something of his life is told in another place. But though Disraeli was of the Jewish race he did not follow the religion, but became a Christian.

The most powerful bankers in the world

Lionel Nathan Rothschild, a member of the great family of bankers which has been powerful in several European states for a hundred years, was the first Jew elected to the English Parliament. Though refused at first, the city of London continued to elect him until the law was changed and he was admitted. His son, Nathan Meyer, was made a member

FOUR OTHER FAMOUS JEWS



Oscar S. Straus has been three times Minister to Turkey, Secretary of Commerce and Labor, member of the Court of Arbitration at The Hague, and Chairman of the Public Service Commission of New York.

Earl Reading, who was made Lord Chief Justice of England in 1913, while plain Rufus Isaacs gained great renown at the law. He has also been Solicitor General and Attorney General of England.

Louis D. Brandeis studied law at Harvard and practised in Boston, gaining a wide reputation. He was appointed a Justice of the Supreme Court by President Wilson.

Felix Adler was born in Germany, but came to the United States as a child. He founded the Society for Ethical Culture, and also lectures at Columbia University.

Pictures by Brown Bros.; that of O. S. Straus copyright, 1906.

of the House of Lords in 1885, the first Jew to be created an English peer. Several Jews have been members of the British Cabinet and in 1913, Sir Rufus Isaacs, now Earl Reading, was made Lord Chief Justice of England.

While the Jews in Germany have not held so many governmental positions, they have surpassed those of any other country in scholarship, and in literature. Some of the greatest scientists, the most learned historians, and most noted scholars have been Jews. One of Germany's greatest poets, Heinrich Heine, was born a Jew.

We must not forget Spinoza, the Jewish philosopher of Amsterdam, nor Sir Moses Montefiore, who gave a great fortune to help his unfortunate fellows, nor David Ricardo, whose book on political economy, which is the science of wealth, is studied in every university. The socialist, Karl Marx, was also born of Jewish parents.

These are only a few out of thousands who might be named, but they are enough to show how talent and genius will gain fame in spite of prejudice and harsh laws.

THE JEWS IN NORTH AND SOUTH AMERICA

It is said that some of the members of Columbus' crew were of Jewish blood, and some of the earliest settlers of the Spanish and Portuguese colonies were Jews. They were particularly numerous in Brazil, where they became very wealthy. From Brazil came a little colony to New York, or New Amsterdam, as it was then called. This city is now the greatest Jewish city in the world, as it is estimated that nearly 1,500,000 of them now live in or around New York. Before the Revolution there were a few Jews in nearly all the original thirteen colonies.

The persecutions in Russia, together with the hope of bettering their condition, have brought many thousand poor Jews to the United States. Here they have settled chiefly in a few large cities, where they often work hard for small wages, and are too much crowded for health. Nevertheless their condition is steadily improving, and many are becoming prosperous. The Jews who came from other parts of Europe years ago, and their descendants, are nearly all successful.

The Jews in the United States have taken, and are taking part in every form of work. Among them are distinguished inventors, lawyers, physicians, writers, actors, scientists, musicians, artists, scholars, and successful business men, as well as mechanics, workmen and traders.

SOME OF THE POSITIONS HELD BY THIS WONDERFUL PEOPLE

Some of the most noted lawyers and judges are Jews; several have served in the United States Senate and about thirty in the House of Representatives; some have been governors of their states; some have served with credit in the army and navy; one, Oscar S. Straus, has sat in the President's cabinet; and another one, Judah P. Benjamin, once United States Senator, was a member of the Confederate cabinet during the Civil War. Justice Louis D. Brandeis, of the Supreme Court of the United States, is a Jew. Some of our most learned college and university professors are of Jewish blood. They write books, edit newspapers, manage theatres, write plays. In short, they have a great share in the intellectual life of the country.

In business they are no less successful. Some of the most important banking houses in the great cities are controlled by Jews. The manufacture of clothing is almost entirely in their hands, and they are also largely engaged in other kinds of manufacturing. Some of the largest department stores in the great cities are owned and managed by Jews.

They are liberal givers to charity and education. They maintain orphanages for homeless children, homes for the aged and afflicted, and some of the best equipped hospitals in the country have been built by Jewish money. They have organized societies to take care of the ignorant immigrant, and to help him when work fails or sickness comes. Many Jews observe the old rule of Moses which declares that a man must give a tenth of his income to religious and charitable purposes.

The desire for the education of his children is one of the most amazing and hopeful features in the life of the Jews in the United States. Coming from countries where education was denied them, they flock to the schools in the United States. While many go no further than the grammar schools, a very large number continue in the high schools, college and universities, and often carry away distinctions from their Christian companions.

THE FIRST APPLE DUMPLING

CONTINUED FROM 6292

THE princess was looking up at the apple-tree, when—plop! down fell an apple at her feet!

It was not a common, ordinary apple, or it would not have been growing there, but a golden pippin.

"Oh dear!" said the princess, picking it up. "I hope you haven't hurt yourself."

"They dared me to do it," said the apple—"the other apples, you know. They said I should be afraid to let go my stalk and jump. And I just held my breath and counted one, two, three and jumped. And now I *have* done it, I'm sorry, for someone will want to eat me, and I am not nearly ripe enough!"

"I will hide you," said the princess.

And she ran into the palace to look for a hiding-place. But whenever she opened a box or a cupboard the apple cried, "That won't do. Someone will be sure to find me there!"

The princess went all over the palace, upstairs and down, looking for a safe hiding-place for the apple: and at last, feeling quite exhausted, she came to the kitchen. The chief cook was rolling out paste with a golden rolling-pin to make a roly-poly pudding with golden syrup in it for the princess's dinner.

The princess was still looking about for a hiding-place when one of the silver saucepans boiled over, and the chief cook left off rolling the paste to attend to it. The instant his back was turned, the princess took some paste and wrapped the apple up in it.

"No one will think of looking for you there," she whispered.

Then she saw that the door of an oven, out of which a cook had just taken a tray of tarts, was open, and she popped the apple in, to hide it twice over.

"Dear me, what is this?" asked the king at dinner, as he caught sight of a round brown thing on a dish.

"I don't know, your Majesty," was the answer. "The chief cook said he found it in the oven, but he thought your Majesty would find it very good to eat."

"Give me a knife, and I'll see."

"My dear," said the queen, "pray be careful. Suppose it should go off suddenly and blow us up!"

"Pooh!" said the king boldly. "Who's afraid?" And he cut it in two with a single stroke of the knife.

"Why," he said, "it looks like an apple. And yet it can't be. For how could an apple get inside—"

"Papa," put in the princess, "I think it must be the apple I had. It wasn't ripe and was afraid someone would eat it. But perhaps it won't mind so much now it is cooked."

The next day the king asked the princess to show the cook how to hide some more apples. And that is how apple dumplings were invented.

THE FIRST HOME, SWEET HOME

A TALE OF A HUNDRED THOUSAND YEARS AGO

AFTER the wild dog pack swept all the animals from the land around the Thames, Wawa and his tribe had bad living. They were hunters who fed chiefly on meat. They did not know how to till the soil and grow food, and were compelled to live on acorns and wild fruit.

Swar did not like acorns at all.

WAWA SAT THINKING HOW TO KEEP UP THE FIRE

"This is pigs' food," he said, one day, to his father. "Even my dog will not eat it!"

"He'll eat it," said Wawa impatiently, "when he is starving like the rest of us."

But the strange thing was that Swar's little dog never seemed to get hungry. The men were weak and the women sad and the children thin and pale. Wawa sat by the great camp fire on Cornhill, trying to think how he could get meat for the tribe to live on. Like his people, he was very lean and worn, and he was losing his wonderful strength of arm.

"I am afraid, my little son," he said to Swar, "we must tramp back and see if the terrible dog pack has left any game there. We shall starve if we stay here much longer."

He rose up wearily to examine the trees and make plans for building a huge raft. The Thames in those days was a wide swirl of water resembling the Amazon and the Mississippi. Instead of flowing into the sea, it ran into the Rhine. It was more by chance than by skill that the tribe had crossed the river safely in the summer; and now that it was swollen with autumn rains, it seemed impossible to return.

"Still, we must risk it," said Wawa, speaking round the camp fire that evening to all the tribe. "It is clear that if we stay here we shall perish. The wild dog pack may return and destroy us. Remember how hard we found it to beat them off before, and they will be even more savage this time. Even if we escape that danger, we shall not live through the winter, with nothing growing on the trees, and no game in all the forest."

As he spoke, the little dog came running through the jungle with something in its mouth. Terror, as he was now called, dropped what he carried at Swar's feet, and then looked up in the boy's face, waiting for a sign of approval.

"By all the glory of the sun," shouted Wawa joyfully, "the little Terror has saved us! Look, he has brought good meat!"

"Hunting! Good hunting!" shouted the tribesmen.

Wawa held up a dead rabbit. Being hunters of big game, he and his men had only searched the jungle for the tracks of deer and of wild sheep and oxen. The night raid of the dog pack had killed many rabbits, and those that

remained dared not show themselves in the daylight. Terror had hunted them by scent in the darkness. Having made a good meal, he had killed for his companions, and brought his kill to Swar.

Terror was furious when Wawa seized the rabbit and held it up for the tribe to see. Leaping up with a snarl, he dragged the animal out of the chief's hand, and again laid it at Swar's feet, and then stood by, growling, ready to attack anybody who tried to rob his master of the spoil.

Wawa roared with laughter, and stooped and patted the faithful dog.

"Well done, Terror!" he said. "After all, Swar is your chief, and you owe your life to him. He shall have the rabbit, and we shall all profit by the lesson you have given us. You have managed to keep fat and strong on rabbits, and so may the tribe."

All thought of re-crossing the mighty river was now given up. The young tribesmen were soon busily engaged in searching for rabbits. The older men made a temporary camp in a flint quarry, and chipped some of the smaller flints into small rough stone knives, sharper-edged than the great stone axes they were accustomed to use. Then the women, taking the new knives, with infinite care, cut the skins of their tents into thin strips of leather, and with these made a great number of snares, which were placed over all the rabbit holes found in the forest.

"WE WILL FIGHT FOR THE CAVES," SAID WAWA

Thus the tribe at last managed to get food as winter was coming on, when fruit of all kinds was becoming rare. Unfortunately, all the tent skins had to be used in making the snares, and when it began to rain heavily, life in the camp became very uncomfortable.

There were days when the great tribal fire was almost put out by the continual downpour, and Wawa became very anxious. In those days there was no one who knew how to kindle a fire. Men had not discovered how to make a flame. It was from rare forest fires and from distant volcanoes that the tribes obtained the blaze they guarded so carefully.

Wawa had carried his precious fire all the way from France, and had built rafts to carry it over the rivers the tribe crossed on their strange journey into the unexplored jungles of England. Now he sat thinking vainly for hours of some means of preserving the sacred camp fire from being put out by the unceasing torrent of rain. If it were allowed to go out, it would be weeks—even months—before they could get it again.

Wawa was a very wise man—one of the wisest men who ever lived in any period of the history of the world. He was only a savage, ignorant of everything on which our own civilized life is based. No savage in the wildest country at the present day is as wild as he was. He and his people clad themselves in skins which they could not even roughly sew together. Several thousand years had to pass before men learned how to make a rough needle by

boring through a small wing-bone of a bird. Another vast period of time then followed before men discovered how to sow grain and gather it and store it. There are some ants—farmer-ants they are called—that do this. But no man in Wawa's time was as wise as these ants.

And yet, though he lived in that far-off time, Wawa was a man of genius. He could invent new things. It was by the slow and painful efforts of men of his sort that mankind gradually improved its way of living. Wawa first tried to protect his fire from the rain by building over it a rough shelter of leafy boughs. But the shelter was so badly built that the wind blew it down, and, in falling, it almost put out the dying fire.

"So that won't do!" said Wawa angrily.

Not knowing how to sew, he could not make new coverings out of rabbit-skins, and again for some hours he sat by the flickering fire, puzzling his brains. He did not go to sleep that night.

"Come with me, Swar," he said to his little son, at daybreak, "and bring your dog with you. I want to explore that hill where I found you with the lioness."

Nothing stirred in the jungle, and when they came to the northern height, they found that that too was deserted. The wild dog pack had swept the caves in the hillside free from the huge beasts of prey that used to dwell there.

"The great beasts will come back," said Swar, "won't they, Daddy?"

"Yes, my son," said the chief grimly. "They'll come back when the deer and the other game return. But they will find their caves occupied. Then we will fight for the caves, and see who is master, man or the animals!"

That was how, thousands of years ago, man first made a home in a cave.

WHEN THE FIRE WENT OUT

OUTSIDE the largest of the caves on the northern heights of London, a little boy, clad in a lion skin, was hammering at a flint with a stone axe. All around stretched the rank, green jungle growth. Over the tops of the sycamores and fig-trees the Thames could be seen, a great breadth of shining water, nearly a mile broad in places, with a terribly swift current. The rains had begun, and the river was filling up from all the little streams from the hills. It swept into the Rhine. This was thousands of years ago.

"Look at the fire in the stone!" cried the little boy to his father, as with his stone axe he struck sparks out of the flint. "Oh, look at the fire in the stone!"

A broad-shouldered man, a mane of red hair falling over his back, and a great red beard and moustache almost hiding his face, came out of the cave, laughing. He was Wawa, the chief who had led his tribe across the river which divided France from England.

"So you have found out, little Swar," he said, "that there is fire magic in stones. All the tribe knows that, my little son."

"Then why don't you make a fire with it?" said Swar.

"We can't make fire out of magic," said Wawa rather sadly. "Not even the greatest wizard can do that. By the flaming sun, I wish we could get fire from the stone, now that the rains are setting in! The woods are all so wet and we cannot get enough firewood under cover in time."

And he went back slowly into the great cave to see that the tribal fire was burning well and bright. In those distant days man had not yet learned how to make fire. Here and there a tribe had found a forest blazing in a summer drought, and, snatching some flaming branches, had made a fire. In other places, far to the south of Europe, fire had been got from a volcano. It was the thing which the poor ignorant savages valued most. It was the only thing they possessed which the beasts had not.

On the young unmarried girls of the tribe fell the duty of feeding the fire night and day, and keeping it alight. The tribesmen used the fire to harden and sharpen the wooden spears with which they did most of their hunting. After being charred, the ends of the wooden sticks were scraped with sharp flints. It took a week to chip into shape a great stone axe, while with a fire a wooden spear could be made in a minute or two; so these spears only were employed in ordinary hunting where

every tribesman needed several in a day's hunt.

Swar, who had just reached his seventh year, had resolved to attack nothing smaller than a mammoth. There were several of these huge, wooly elephants in the jungle which stretched between Hampstead and the Thames; and two days before, while Swar was squatting by his father's side near where Camden Town now is, he had caught a glimpse of one of the great beasts.

In serious, childlike fashion he went on hammering at the big stone which he wished to make into an axe. Sometimes he hit the stone; sometimes he hit his fingers. There was not enough strength in his little brown hands to strike the least bit off the great flint. Terror, the wild dog which he had found when a puppy, and trained, kept frisking round him, and trying to get him to play. But for some time Swar vainly went on with his work. He had seen two tribesmen making a tremendous stone axe for his father, and naturally he, too, wanted to make one for himself.

Suddenly he was interrupted. A young tribesman came running at full speed up the hill, breathless and wild with excitement.

"Deer!" he shouted. "A great herd of deer down by the river!"

Out of all the caves rushed a crowd of joyous men and women and children. Winter-time was at hand, and the tribe had not seen any big game for months. The rabbits had saved their lives, but rabbit-flesh palls.

"Seven spears for every man!" cried Wawa, in a loud voice. "And down to the water at once! Women and children all follow, and help to bring the meat home!"

Then Bina, his wife, spoke.

"But some one must remain at home to tend the fire," she said.

"Well, let the youngest children do that," exclaimed Wawa. "You know how we had to starve all the summer. It may be worse in the winter if the dog-pack returns and sweeps the jungle again, and it is likely they will scent the deer."

"Yes, yes!" shrieked all the tribesmen, dancing in excitement, and waving their spears above their heads. "We cannot lose a single deer. Leave one of their bodies for a minute, and a wolf or hyena will get it. The chief is right. All the women must come with us."

Wawa was already running down through the jungle at a hard, steady pace. His men whooped, and then followed him silently and swiftly; and the women and girls and older boys went after the men.

Bina stayed behind for a minute, and talked to her little son.

"Now, Swar," she said very earnestly, "you must be a great chief like your father, and see that all the children keep the fire burning. Make them bring a lot of branches and put them all carefully on the flames."

"Very well, mother," said Swar proudly. "You'll see, I'll make the biggest fire in the whole world."

When his mother went away it began to rain heavily. But this did not daunt Swar. It was the first time he had been set in authority, and he was resolved to astonish the tribe by his magnificent work. He kept the children for hours running out into the jungle, and tearing down wet, dripping branches. When they could not reach the branches themselves they grasped and tore off armfuls of wet leaves. At last a big mass of soaking leaves was built above the fire, and Swar was still keeping the children busily employed, when the tribesmen came tramping back with the spoils of the hunting.

Wawa dropped the two deer he was carrying when he saw what his little boy had done.

"By all the splendor of the sun," he cried, in a wild voice, "what have you children done to the fire?"

He began to tear away the stack of wet leaves. Quickly the men saw what was the matter, and so did the women. Shrieking with fright, they, too, tore at the wet green stuff, and at last pulled it all off the hearth. But it was too late—the rain-water had completely put out the fire. Where it had been, there was now only a pool of dark mud.

In the darkest corner of the cave crouched Swar, sobbing as though his heart would break. His father was too upset to be angry with the little boy. The loss of the fire was the most terrible disaster which could have occurred to a tribe. It left them open to attack from the most cunning and the most savage of all the wild beasts—the huge cave

bear and the huge cave lion, who were certain to return now that the deer were by the Thames. At first Wawa thought it would be safer to camp out in the jungle; but it was still raining heavily, and the tribe now had no skin tents. They had used all their skins in making snares.

"Well," he said, at last, "the women and children must sleep together in this big cave, and the men must take turns in keeping awake at nights and watching over them."

"You sleep, too, chief," said one of his men. "You must be more tired than any of us."

"No, I will help you keep watch," said Wawa wearily. "I cannot sleep. I must think of a way," he added. "Oh, if only there was a tribe from whom we could borrow fire!"

But there was no other tribe within a hundred and fifty or two hundred miles. Weeks must elapse before a fire messenger could go and return.

"It will be necessary," thought Wawa sadly, "to go back across the river."

As he was considering whether he should wait till the meat was cured, or lead his tribe away at daybreak, a cold wet little figure came and nestled up to him.

"Father," said Swar softly, "couldn't we get some of the magic fire out of the stone?"

Wawa shook his head. He looked down at the ground, thinking of other things, and his eyes idly rested on a heap of dry leaves in a corner. The dawn was just breaking.

"That's it!" cried Swar, following his glance. "Let us set light to the leaves with the fire in the stone."

Sitting among the dry, withered stuff, he began eagerly to strike fire from the flint. It was easy work after making an axe, and being chief of all the children. His father watched him listlessly. Suddenly he started up with a cry of joy, and, taking the stone and the flint axe from his little son, he began to strike them together quickly and lightly and steadily. He had seen a spark burn a tiny hole in a very dry leaf.

Half an hour afterwards the men and women and children were awakened by a wild, shrill, strange song. Wawa was dancing about the cave, singing and holding Swar above his head. In a corner was a little smoking heap of leaves and twigs. Man had made the great discovery—he had found out how to make a fire.

HOW THEY GOT A HOLIDAY

SOME schoolboys, who had failed to obtain a coveted holiday, thought of a plan for getting the schoolmaster out of the way.

"If we could only get him to think he is ill," said the eldest of them, "he would be ill"—which was perfectly true. So they arranged that, as they entered the school the next day, each one should say to the master:

"Good-morning, sir! I am sorry to see you looking so ill."

The schoolmaster replied, "Ill? I'm sure I don't feel ill."

But when others made the same remark, after a little he shut his book, and said he would return home.

So the boys got the wanted holiday. But the next morning they were surprised to find nobody at the school.

"The master must be really ill," said the boys. "We had better inquire."

A deputation started out and on the way they met a man, who told them that the schoolmaster lay in his house tossing on his bed in a fever.

"Follow me," said the eldest boy, "and do as I do."

He led them into the sick-room, and, going up to the master, said: "Good-morning, sir! You are looking quite yourself again."

"Am I?" said the schoolmaster. "I was feeling very ill."

"Oh no," said the boys. "You are nearly well again. You ought to get up and take a walk."

"Perhaps you are right," said the sick man. He got up, and in a few hours had quite recovered his health.

WHAT THIS STORY TELLS US

WHAT do we mean by the spirit of a country? Does a country really have a spirit, and if so, what is it? This question is not so hard as it seems, for we do know that the people of a country differ very much in their ideas, and in the way they look upon the world. We say that the people of some countries are slow to change, dependable, and obey the laws; that the people of other nations are restless and unreliable. This story tries to tell how Canadians look upon their country, and the world, and what are the deepest feelings they have. We are told that the Canadians are proud of their own country, and yet are loyal to the British Empire; that they feel that their country is sure to become one of the most important parts of the world.

THE SPIRIT OF CANADA

CONTINUED FROM 6297

WHAT is the spirit of a country and where does it lie? At first this seems a puzzling question; but when we think about it a little we find that it can have only one answer: The spirit of a country is the spirit that animates the great mass of the people, and it has its home within their hearts.

You see, therefore, that each child of the nation is born to be a guardian of the spirit of the nation. To each one comes the responsibility of helping to give it strength to soar high in the heavens, with the strength and vision of an eagle, or of letting it creep along the ground, a broken moth, with feeble, fluttering wings.

Each person that we meet has one or more striking characteristics, which stand out as a sort of index of his spirit, and we say he is loyal, he is true, and honorable, or he is false, or dishonorable and cruel. Nations are made up of persons, and so they, too, have this index, and it is wise to take stock of our spirit, and hold fast to the good that is in us. As the boys and girls of to-day feel and think, so will the nation of to-morrow be.

Although Canada of to-day is a far different country from Canada of yesterday, to understand the spirit of Canada we must look back into the past. When we have done that we may look forward to the Canada of the future, which is destined to become a great and mighty nation.

For a century and a half, the history of Canada was one of conflict, and it was not until after the country came under the British flag that we find the beginning of constitutional government. This was given by the Quebec Act, which, although it did not provide for government by the people, was a constitution, under which the government had to work, and was in a measure a preparation for the responsible government which came later.

We must remember that at the time of the conquest of Canada, the French government was despotic, and the people were not accustomed to self-government and did not ask for it. It was otherwise with the English-speaking settlers in Ontario and the Maritime Provinces. They were of British blood, and had been fighting for liberty for many centuries.

Within twenty years after the conquest, the United States had fought the War of Independence, and had been declared independent. But, as we have read elsewhere, there were thousands of people who had not wished to revolt against Great Britain, and wished to keep their allegiance to

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the flag under which they were born. Large numbers of these people were loyal to their principles and left the country to make new homes in other places. Many of them came to Ontario and New Brunswick, and the Eastern Provinces of Quebec. These pioneers, as we can imagine, were for the most part strong men and women, whose outstanding characteristic was their loyalty. They had a great influence on the future of the young nation, and loyalty is still one of the distinguishing marks of the Canadian spirit.

These men were not content with the government provided for them under the Quebec Act. They had a strong and determined love for liberty and freedom, and almost before they were settled in the country, they demanded the right to govern themselves. As early as 1784, New Brunswick received her first constitution, and four years later, a new constitution was given to Ontario and Quebec.

This was only the beginning of the struggle for complete self-government to which they were impelled by their love of liberty. It is true that some of the people were inclined to go more slowly than others. Some of the pioneer settlers were steeped in the shadowed memories of a past struggle for king, institutions and country. They were embittered against what seemed to them too democratic tendencies, and prejudiced against the radicals of England, who had assisted in ruining the royal cause in America, as well as against the French of Quebec, who had been so long the traditional enemies of England, and the sincere foes of British supremacy in North America.

It is difficult for the Canadian of to-day to comprehend the situation in those older days. Newspapers were so few as to be of little significance. Books were scarce, high-priced and of a character not intended to throw light upon existing problems. Towns were small and far apart, and the English settlers at first were scattered. Gradually, however, the population increased. Schools were founded, and the intellectual life of the provinces awoke. At first it showed itself chiefly in political activity.

The people of Lower Canada were still wrapped up in the traditions and surroundings of many years before. Under the British flag they were dreaming of the ideals of Old France in the days of Louis XIV, and of New France in the time of Frontenac. When the parliamentary system of government came to them they accepted it as a part of the new situation, but soon learned to use it to defend their old institutions against change. In Upper Canada, the increasing population had different political ideas, and soon a struggle arose, between those who desired to hold on to what they looked upon as the settled order of things, and the more adventurous spirits who sought for greater progress and freer institutions.

From the struggles in both provinces came the Rebellion of 1837, and later the conflicts which ended in Confederation, in which the Maritime Provinces joined. British Columbia, which already had a constitution, soon became part of the Dominion, and, as the land was settled, the younger provinces came in. With Confederation came responsible government, the most democratic form of government there is, and to-day the rule of the people, by the people, and for the people, is recognized as the only possible form of government for Canada.

The political leaders have greatly changed in character as the country has slowly broadened from a colony into provinces, from provinces into the Dominion, and from the Dominion into a British nation. At first, the idea of Canada as a nation did not exist. For a time the English leaders strove to imitate English manners and customs, while the French continued to dream of the past. But as years advanced, a national feeling awoke. Quebec has lagged behind the other provinces; but in spite of what sometimes has seemed like backward steps on their part, there is an ever growing feeling that, whether French or English, all are Canadians. The people of Quebec see that their future is wrapped up in the future of the Dominion, and the majority realize that they as Canadians are interested in everything that promotes the interest of Canada.

Since Confederation, Canada has been practically independent, and can truly say, "Daughter am I in my mother's house; but mistress in my own." This does not mean that she has any desire to break away from the Motherland. On the contrary, the pride of Canadians in the British Empire has grown with the

passing years. Instead of putting on the cloak of Independence, Canada prefers to develop her resources and to work out her destiny within the empire of which she is a part. Suggestions of a break with the Motherland pass unnoticed, for the people have no interest in them. Nevertheless, though Canadians are proud of their place in the empire, proud of the work that the empire has done in the world, and of the stand that it has taken for justice and right, there is a strong national feeling in Canada. Canadians have a profound love for their native land, that is sometimes hidden, but is always there.

This feeling is closely interwoven with their love for, and pride in the empire of which the Dominion is a part. Like the people of all the sister Dominions, Canadians unite democratic institutions with a fervid love for, and loyalty to the British Crown; the knot, as it were, that ties the invisible cables that hold them together. They look upon the Motherland as grown children look upon the home of their childhood. It is the place where all have a common right to meet, where all are sure to find a welcome.

That this is no mere sentiment, but a deep, insistent feeling, has been proved on many a hard-fought battle-field. More than once Canadians have gone to the aid of the Motherland, unasked, that they might help her to uphold the standard of loyalty, right and justice. When the empire was hard pressed, Canada held back nothing. Her bravest sons went out to fight, her daughters stayed at home, not to weep, but to work, and she gave unstintingly of her resources to further the cause that she had at heart.

The continuance of these close ties is of great importance to the empire. Canada holds the bridge in territory, and power, and upon her continued loyalty depends the unity of the imperial system.

Canada lies in the great pathway of commerce; her transcontinental lines furnish the shortest routes around the world. Only a small, though increasing, part of the millions of acres of rich agricultural lands are under cultivation. Either wheat or traffic would make Canada a very prosperous nation. The inland water courses are being improved and this development will have a great influence upon transportation. Future generations may witness the unique spectacle of vessels from European ports loading from the elevators at Winnipeg or cruising for hundreds of miles up the Saskatchewan for cargoes of grain. This is an alluring prospect and one that Canadian pluck and enterprise may bring. The waters of Canada, apart from the soil, are the greatest and most valuable undeveloped resource. More valuable than minerals, because, properly conserved, they will never be exhausted, but, on the contrary, they can be increased. Water power will be the most important factor in Canadian progress and industrial development. Canada possesses all the metals and minerals that mankind uses, but the wealth of her mines has scarcely been touched. Her fisheries, ranking with those of any other country, are yet in their infancy.

Her thousands of square miles of forests under proper care and management will ensure unlimited wealth for the future. All these conditions assure for Canada the foremost rank as a producer of raw materials and as a manufacturer of finished articles.

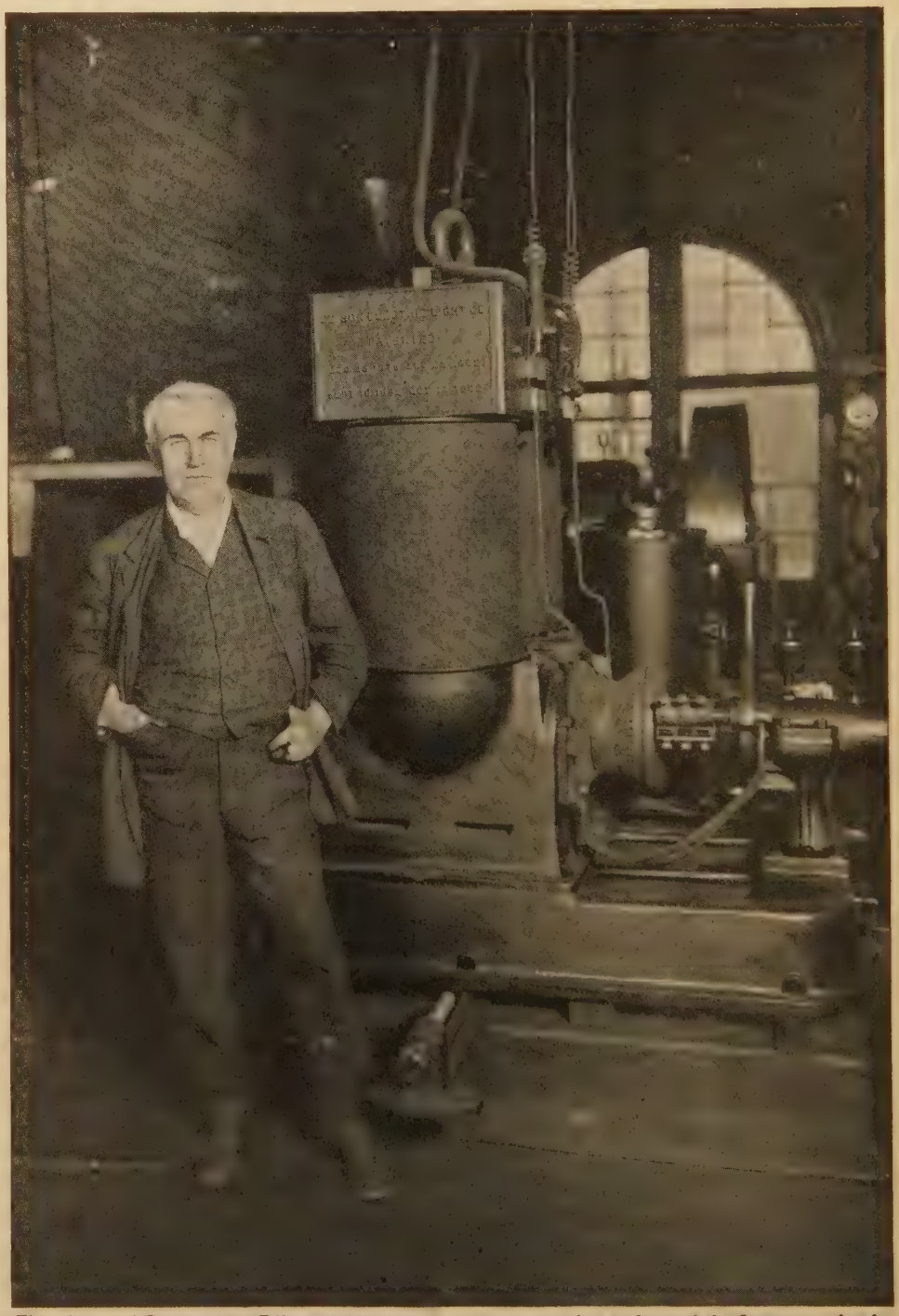
Canada has learned a valuable lesson from the great producing nations of the world. Everywhere else the policy of protection of natural resources was not developed until these resources had been largely exhausted.

In Canada the people have in time realized the importance of protection of the great natural wealth of the country, and much has been done by legislation to protect and help the development of the natural resources. The people know the importance of legislation dealing with the protection and the promotion of material wealth and the comparative unimportance of mere party conflicts.

The four hundred years of Canadian history which has gone into the making of the Dominion are of a nature to stamp its future with every fair prospect of success. The position of the country, the extent, the resources, the unity and the transportation facilities should make the wealth and the commerce of the future as certain as the aspirations of the people are strong.

While the people of Canada keep their loyalty, and hold fast their ideals of truth and justice, their faith in the Empire and the Dominion, and the unity without which no nation is strong, they need have no fear of the destiny of their country.

A MODERN WIZARD



This picture of Thomas Alva Edison, in his vigorous old age, was taken in front of the first motor that he made when he was working out the system of electric lighting by incandescent lights, which have taken the place of arc lights. The little motor is carefully preserved in his power house, amid all the powerful machinery of which it was the forerunner. It is difficult to say which is the most important branch of electricity with which Mr. Edison has been connected. Photograph copyright, Brown Bros., New York.

WHAT THIS STORY TELLS US

THIS is the story of a man who by hard work has gained a place in the admiration of his fellow countrymen which has been seldom surpassed. Few people are able to do such work as Thomas Alva Edison has done. We must remember, however, that if, at any time in his early life, he had been content with the work that he had done, he might have remained all his life a magazine vendor on a train, or a telegraph operator. If he had been content to stand still, not only his country and the world, but he himself, would have been the loser. He did not stand still, for he was discontented with himself, and so he is known the world over. It is probable that he would be well content to be known as a man who has always done his best, and, even though we cannot all make great inventions, that is a title that any one may deserve. We never know what we can do until we try, and so this story of a Modern Wizard who found out, by trying, what he could do, is of great interest and encouragement to us, though we may never accomplish the wonders he has achieved.

A MODERN WIZARD

CONTINUED FROM 6257

SUPPOSE you are a boy or girl living on a farm remote from a large town. Nevertheless you may sit on your veranda in the summer evening, reading THE BOOK OF KNOWLEDGE by electric light, while your mother sits gently swaying in her rocker, her needlework in her hands, listening to the voice of one of the great singers; your father sits, smoking, now and then standing up to change a record in the phonograph from which the sweet sounds come pouring out. Or perhaps it is a winter evening; then you may telephone to a party of young friends to come and dance to the music of a good orchestra, or, gathered round a cosy fire, you may listen to a recital by a great violinist, or if you have been reading in the Book of Men and Women of the music written by the great musicians, you may turn to your phonograph so that your ears may become familiar with the sweet and stirring songs, simple melodies, dances or great sonatas and symphonies that they have written. Or, perhaps, it is Friday evening. Home lessons are laid aside until Saturday; there is a "movie theatre" in the nearest village, or motion pictures are given in the schoolhouse. Then for an hour or two you are taken to places of interest in our own country, or in places far distant; you laugh heartily over a comedy, or your hearts ache over some sad, pathetic story. A great parade was held in one of the cities a week ago, and the men and women march down toward you on the picture screen; you see the launching of a proud ship; the forging of a giant anchor; a carnival held in New Orleans, or in Rome, or perhaps a wedding procession in Bombay.

How all these things are done is told in other parts of the book. Here we are going to read something about the man to whom we owe it that our lives are so much richer than the lives of our grandfathers and grandmothers, or even our fathers and mothers when they were young.

Thomas Alva Edison worked out his inventions by known laws of science. This means that he studied these laws, so that he was able to apply them to make real the visions of his imagination. Yet he had few advantages and little help, and his story is one of those that inspire us to great effort to cultivate the talents that have been given to each one of us.

He was born in February, 1847, in the little village of Milan in Ohio. His parents were poor because his father did not keep to a settled occupation. He had the same kind of mind as his

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wonder-working son; the kind of mind that is called versatile, that can easily turn from one thing to another. He had not learned, however, that it is necessary for a man with a versatile mind to learn to do one thing thoroughly before he turns to another, and so he was not successful.

Edison was a quiet, thoughtful little boy, but very inquisitive and always wanted to know how things were done. He was not very strong, however, and was not sent to school until he was quite a big child. When he did go, his teacher, who does not seem to have been very wise, thought him stupid because he asked so many questions. So his mother, who had herself been a teacher, took him away from school at the end of two months and taught him at home. With so kind and loving a teacher, he made rapid progress; and above all, he learned to think. His mother had some good books, which he learned to enjoy; and when he was ten years old, he read Gibbon's Decline and Fall of the Roman Empire; Hume's History of England, and began to study an encyclopedia. It was probably from the encyclopedia that he first learned to take an interest in chemistry.

By this time, his parents, who had moved with him to Port Huron, Michigan, were able to indulge him in his love for making experiments, so he bought some books, made a little laboratory in the cellar of his home, and there laid the foundation of his knowledge of chemistry.

When he was twelve years old, he decided to start out in life for himself and became a newsboy on the train which ran from Port Huron to Detroit. Such a newsboy had never been seen before. He was given a corner in the baggage car in which to keep his stocks of newspapers, magazines and candy. To this corner, he moved his little laboratory and library of chemical books, and when he was not engaged in his business, went on with his experiments. Still time hung heavy on his hands, and to fill it up, he bought a printing press and type and published on the train a weekly newspaper filled with local news, stories of things that happened on the railway and notes of the markets.

All went well for two or three years. But when he was in his sixteenth year, one day a phosphorus bottle was jarred off one of his shelves and broke on the floor. It set fire to the baggage car, and in his anger at the danger to his train, the conductor not only put the boy off the train, but soundly boxed his ears. That was the most unfortunate part of the accident, for as a result of the boxing Edison gradually lost his hearing, and became almost totally deaf. His stock was lost, but an act of great bravery on his part brought to his aid a new resource, and opened up a new field for him to work in.

He was standing one day on the platform of the station at Clemons, in Michigan, watching a train come in, when he saw the station agent's little boy on the track right in front of the oncoming engine. Another moment and the child would have been crushed; but Edison sprang to the track, seized the little one in his arms, and rolled with him to one side, just in time to escape the wheels. To show his gratitude the baby's father offered to teach telegraphy to Edison. The offer was gratefully accepted, and now that his career as a train newsboy was closed he turned to his new accomplishment as a means of making a living.

He worked at telegraphy for some years, first in Port Huron, in Michigan, then at Stratford, in Canada, and a little later in the Western states, and finally in Boston, while at the same time he spent all his spare moments in the study of chemistry and electricity, and in experimenting on improved telegraph apparatus. It was during these years that he first turned his attention to duplex telegraphy, but through no fault of his own, he was unable to sell his invention, and the matter dropped for a time.

In 1869, when he was in his twenty-second year, he went to New York. He arrived penniless in the city; but he was a good telegraph operator, and was fearless of the future. And now a strange thing happened. He applied to the Gold and Stock Telegraph Company for work, and while he was waiting for a reply, part of the apparatus broke down. No one knew what was the matter, and everything was in confusion, until Edison said he could set the machine at work again. Permission was given him to try, and at the end of two hours, work in the office was going on as if nothing had happened. Edison was asked if he would accept a position at a salary of three hundred dollars a month, and needless to say, he accepted.

His new position gave him money and leisure for new inventions. In a little

over a year, he sold his telegraph inventions for a large sum of money. This enabled him once more to set up in business for himself. He built a factory in Newark, New Jersey, for the manufacture of telegraph apparatus, and since then his chief business has been that of making inventions.

The first great invention was the quadruplex system of telegraphy, about which you have read in the story of the telegraph. About the same time Edison made an improvement in the transmitter of the telephone which made it easier for the voice waves to travel, and improved the usefulness of the telephone very much.

It was just about the same time that he invented the phonograph. The idea of an instrument which would "write sound" and reproduce it, had been thought of before, by scientists, though it is doubtful if Edison knew of their efforts to make such an instrument. At any rate, he was the first to make an instrument which would work, and even he did not know that it would work until he heard it repeat the words that he had shouted into it. He says himself that when he put the reproducer in place and the instrument shouted back to him the words "Mary had a little lamb," he was never so taken aback in his life.

Edison patented his invention, which from the first excited the wonder of the world. Of course, like all first things, it was crude, and the sounds that it gave back were harsh. For the time he had to lay it aside, for other work pressed, but others took it up, and from his parent idea the gramophone, dictaphone and other instruments were invented. Later on, when he had more leisure, he commenced work on it again, and worked out a very perfect instrument which gives back every beautiful vibration from voice or instrument. The dictaphone, as you know, is a little instrument into which busy men and women dictate letters or documents or directions for work. Then the dictaphone operator causes the instrument to send the stored up sound waves into her ear, and from its dictation the letters or instructions can be written.

When electricity was first used for illumination, only large arc lights were used. The lamps sputtered and scattered sparks, and the light was so harsh that it could be used only for street lighting and large buildings such as factories, drill halls and the like. Such a thing as incandescent lights, which make possible the use of softly shaded lamps, or indirect lighting in our homes or the brilliant illumination of churches, concert halls and theatres, was not even thought of. This was the work for which Edison put aside the work on his phonograph. He believed that a number of lights could be supplied from one distributing wire, and he believed that the light could be improved so that its use would be a common thing, so he invented the incandescent lamp, and the system of circuit lighting of which you may read in the Story of American Inventors. He spent a couple of years over this work, and to perfect his system improved dynamo machines, and invented a whole scheme of distributing electricity so that it might be used for light, heat and power. The result is that you may sit on your veranda and read by a lamp lighted by electricity, the power for which has been generated perhaps at a waterfall miles away, and the same power sends electricity to work and light mills and factories, drive railway trains, and light the streets of villages and towns that would otherwise be dark.

Once his work on the incandescent lamp was on the way to success, Edison turned his attention to another great project, that of driving railway trains by electricity. He was not the first man in this field, but his work aroused interest in it, and his inventions are largely used.

Now we come to the moving pictures, where again Edison took up an idea which others had had before him. From the story of the motion pictures, which is told on page 5135, you may see that while it cannot be said that he invented the moving pictures, the invention on which the moving pictures are based is his.

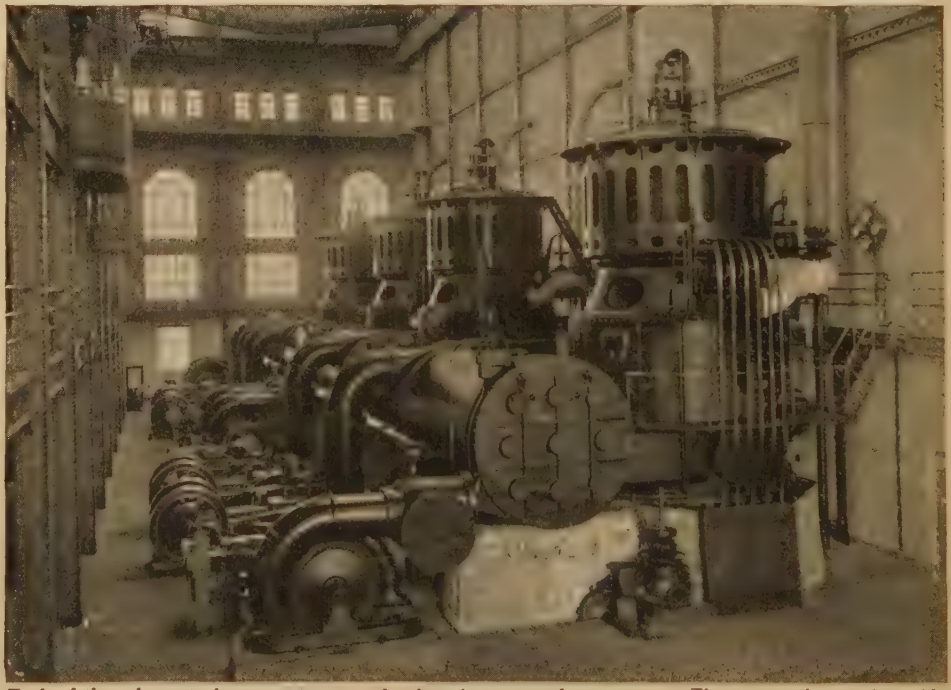
These inventions are only a small part of the work done by this wonderful man. He has invented a new storage battery, giant rolls to crush rocks, a kiln for use in making Portland cement, and numbers of other things which he needed to help him in the larger work in hand.

After the Great War commenced he found himself in danger of being cut off from his supply of carbolic acid for his factories at St. Lawrence, New Jersey, so he devised a way of making it for himself, and also for making the benzol from which the carbolic acid is produced.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 6363.

WHERE ELECTRIC POWER IS GENERATED

Trains entering and leaving the Grand Central Terminal in New York are hauled by electric locomotives, which we show you in another place. The power is generated miles away in large power houses. This is the Port Morris station on Long Island Sound, so located because coal can be easily and cheaply brought to it, and there is also an abundant supply of water to condense the steam from the many great boilers.



Each of these large turbo-generators can develop about 7,000 horse power. The current is sent by cable to substations, which deliver it to the third rail, which you see beside the tracks. Mr. Edison did some important work on the use of electricity in transportation, but his attention was turned to other things.

Pictures by courtesy of the New York Central Lines.

Jack's voice-box, with covering partly removed to show changing of position of vocal cords. First picture shows an opening for breathing, the second the cords forming chink for singing high note.

JACK'S WIRELESS TELEPHONE

THE BOX IN WHICH HE KEEPS HIS VOICE

CONTINUED FROM 6310

WE remember that, as the air went down to ventilate Jack's house, it had to pass through a very narrow place, which was opened to let it go through. That opening has no use at all, so far as the ingoing air is concerned, though it is true that Jack can make noises, and even speak, by means of his ingoing air; but that is very tiring to Jack, and still more tiring to the people who have to listen to him. The real business of this narrow opening, and the voice-box that holds it, is with the air as it comes back from Jack's bellows. This air, we remember, is warmer, and much moister, than it was when it was taken into the lungs or bellows; it contains less oxygen, more carbon dioxide, and just the same quantity of nitrogen.

Other creatures can make more noise, some of them can make much and more alarming noise, some of them can make sweeter sounds and can keep up their voices for a longer time than Jack can, but no other creature has anything to approach the voice-box of Jack's house for the beauty and the variety and the expressiveness and the usefulness of the sounds it can produce. Perhaps, however, if the truth were told, the credit of this goes less to Jack's voice-box than to the wonderful group of head-servants who live in the upper part of his brain.

Now, before we describe this voice-box or larynx, we must understand what it really is, and what it enables Jack to do. We know already that his house, like some great office or hospital, has a magnificent telephone system of its own, by which all its parts can communicate with one another. We already know very well that this wonderful telephone system has millions of little batteries called nerve-cells, and that these nerve-cells communicate with each other, and with every part of Jack's house, by means of a wonderful kind of living wires which are called nerves. These nerves do undoubtedly play exactly the part of wires: messages run through them; they direct the course of the messages and keep the different kinds of messages to them-

selves. The nerves are definitely of two kinds—one carrying messages from Jack's brain only *outwards*, and one carrying messages only *inwards* to the brain. If these nerves are cut, the messages cannot travel.

But an office or a hospital not only needs its own private telephone system, but also requires some arrangement to enable it to communicate with the outside world. It requires a machine for sending messages, and it requires also another kind of machine, called a receiver, for taking in messages. Now, if an office or a hospital requires such arrangements, much more does Jack's house. Any other kind of house may get along by itself, but Jack's house cannot. It was made and meant to be one of many, all living together, and helping one another, and communicating with, and serving one another.

THE TELEPHONE THAT IS ALWAYS MOVING

It follows that the arrangements for sending and receiving messages are of the first importance in Jack's house; and here a difficulty at once arises. Ordinary houses are built to stand still where they are placed, and there is no particular difficulty in setting up machines in them with wires through which the occupants of the houses can speak to each other and be spoken to. But we could hardly have a telephone put into our house if it were constantly walking and running about, and might any day set out without warning to make a journey of a hundred or a thousand miles.

There are, of course, such things as wireless telephones, and people can talk to each other by means of telephones at great distances without wires, just as they can telegraph to each other. What happens is simply that the electric waves, which, in other cases, run along wires, in this case run through the air in an invisible kind of something we call the ether. This we consider exceedingly wonderful, but it is really one of the oldest things, and we all do it every day, although instruments for wireless telephony were invented only a very short while ago.

WHAT JACK'S VOICE-BOX REALLY DOES

Jack has in his throat a marvelous machine for making waves, which need and have no wire, and with this machine he daily telephones — which means "sound afar" or "speak from a distance" — to the people around him, everyone of whom has the same kind of instrument; and he also possesses a much more wonderful receiver, called the ear, which catches these waves, and then sends an account of them to the brain by means of certain of the wires that go to make up the *inside* telephone system of Jack's house. Now we have some idea of what Jack's voice-box really does, and we can proceed to examine it and see how it does it.

Of course, it is not always in action —if Jack has any sense. Yet when it is not in action it must always be on its good behavior, for as long as Jack lives air must pass through it, whether or not it chooses to make use of the air on its own account.

This wonderful voice-box, or larynx, the message-sender of Jack's wireless telephone, is made up of a number of separate pieces of cartilage, or gristle, a firm, fairly stiff substance which is not bone, and yet is something like it. When Jack's house grows very old, these pieces of gristle are likely to get too much lime in them, and become more like bone than they should; and this is probably the chief reason why the voices of old people change, and become weak and shaky.

WHEN JACK'S BOX GROWS MUCH BIGGER

When these pieces of cartilage are put together they make a kind of box, which we can readily see and feel in the throat, and which is sometimes called Adam's apple, because of the stupid idea that it is the apple that Adam swallowed, which stuck in his throat. It is true, however, that this "apple" is much bigger and more noticeable in men than in women, and that is why men have stronger and deeper voices than women.

When Jack and Jill are children their voice-boxes are very small, but at some time in their teens their voice-boxes, especially Jack's, grow much bigger. This happens so quickly in Jack's case that, for a time, he loses control of his voice-box, and his voice is likely to break, and sound sometimes high and sometimes low without his meaning to make the difference. Also, if he has been a singer, his pure child-like high notes

begin to go, and gradually he gets deeper notes which he never had before.

When the voice-box has grown up, so to say, we can readily feel in our throats the largest of the cartilages, which projects forwards, and beneath it we can feel a regular, strong ring, which is the lowest of the cartilages, and supports the others.

But we can really learn nothing about this voice-box until we look inside it. In the middle of last century an inventive Spaniard, a great teacher of singing, called Manuel Garcia—who lived to be more than a hundred years old—thought he would like to be able to see the inside of his own voice-box, and he actually invented a little mirror which can be passed into the back of Jack's throat, and with which can be seen reflected the inside of the voice-box. Garcia invented this laryngoscope, or larynx-seer, because he wanted to learn about singing; but, somewhat improved, it has become a valuable invention for doctors, enabling them to save many lives and voices and relieve a very large amount of pain.

THE CORDS THAT HELP JACK AND JILL TO SPEAK

What we see with the aid of the laryngoscope is a pair of vocal cords. When these are quite well they are pale white to look at, and they move together, towards or away from each other, quickly and easily and equaly; so that the space between them is always exactly in the middle of the larynx, and that means also exactly in the middle of Jack's house. If one cord were moving badly, the other would come across to try to meet it. Also, if Jack has been talking too much, or has been smoking too much—a very common reason—and also in people who drink too much, the cords are not pale white, but slightly reddish, and then the voice is husky, and soon grows tired.

The cords are made of pure elastic fibres, covered by a layer of smooth, flat cells. In front, as the picture shows, they are attached close together behind the front part of the big cartilage which we can see and feel so easily.

But each of the cords is attached behind to a corner of a little separate piece of cartilage, and each of these pieces of cartilage is so posed that it can rotate and twist upon itself. When it twists in one direction, it carries the end of that vocal cord towards the middle of Jack's throat, to meet the other cord. In health, both cords always move at the same time, and so in this case the cords will almost meet—not quite, but very nearly. Every time Jack speaks or sings, this is the first thing he does; and if he cannot bring his cords close together like this he has lost his voice, and can only whisper.

WHEN JACK SHOUTS AT THE TOP OF HIS VOICE

But when the piece of cartilage that carries the back end of its vocal cord twists on itself in the other direction, it carries the cord away from the middle, and away from its fellow. Both little cartilages do this at the same time, and now what was before a narrow chink becomes a triangular opening that readily lets air through in either direction, without producing any sound.

Our business now is with what happens when Jack puts his vocal cords together as the air is coming out of his chest. In the first place, he does not content himself with letting the air come out by the elastic recoil of his stretched lungs and ribs and muscles, as he usually does. That would not give him enough force for his purpose. On these occasions he makes a "forced expiration." By contracting the muscles of the ribs and calling on the great muscle named the diaphragm for assistance he expels the air with great force through the narrow passage in the voice box. To get enough outgoing breath to do this, Jack and Jill must learn to fill the lower part of their lungs very full of air.

THE WAVES THAT SPREAD IN ALL DIRECTIONS

But to be able to make a loud sound, Jack must do even more than all this. Not only does he bring his vocal cords together, but he also deliberately makes them tight. The cartilages to which their back ends are fixed sit on the top of the ring cartilage, which is shaped at the back exactly like a signet ring, and has a wide space for them to rest on. Now, when Jack thinks fit, he can tilt these little cartilages backwards so as to make his vocal cords tight; and then, if a current of air is pressed hard and suddenly against them, they have no choice but to vibrate, or tremble, like

any tight string you might pluck with your finger.

Thus Jack's wireless telephone produces air-waves — commonly called sound—which leave his house, and may be picked up by any receiver, such as the ear of a man or an animal, or the receiver of a phonograph. These waves, like the waves of other wireless telephony or telegraphy, spread in all directions, and cannot be directed beyond a slight degree, because there is no wire to confine them.

THE TINY THINGS ON WHICH THE BEAUTY OF SPEAKING DEPENDS

The pitch of the sound depends on the number of waves produced in a second, and that depends entirely on the tightness of Jack's cords. It differs in different people, because some have heavier and longer cords, and these will always vibrate more slowly, and make lower-pitched sounds, however tight they may be pulled. But, in any particular case, the higher notes will be produced when Jack tightens his cords, and the lower notes when he relaxes them. He does so all the time, when he is speaking or singing. Listen to anyone speaking, and you will hear how the pitch of his voice rises and falls, differently at different times; so that, for instance, you could tell by the change in pitch that he was asking a question even if he were using a language that you did not understand. Half the beauty and interest and expressiveness of speaking and reading aloud depends on these changes of pitch —which depend on the use of a tiny pair of muscles, and a special pair of nerves. Men who speak in public ought to pay as much attention to the way they use their voices as singers and actors do.

HOW EVERY PART OF THE HOUSE HELPS JACK TO SING

In great singers this power is marvelous. They can control the pitch of the voice within wide limits, at their will. They can maintain the clearness and beauty of the tone equally when they are singing so softly that the note sung is like a far-off whisper of fairy sweetness, and when they are producing a great outburst of sound; and they can alter, also, the quality of the tone in order to express different kinds of feeling.

But it is not to be supposed that the voice-box itself, without any help, is equal to all this, much less to producing words. On the contrary, every neighboring part of Jack's house is called on for aid. When he speaks or sings deep and loud, he can feel his whole chest vibrating and helping to make the sound what it is. His whole throat is at work, too. Indeed, unless he has been properly taught to sing, he is in danger of using his throat too much, or using it in the wrong way, and in that case he may produce sounds that make us say that he sings "out of tune." His tongue is always at work, either lying low and smooth in the floor of his mouth, or moving about to make the vowels or consonants. His lips are at it, too, as deaf people know, when they learn to read the lips because they cannot hear. His soft palate, at the back of the roof of his mouth, rises and closes the back of his nose, so that he does not produce a nasal tone; and in good singers, when they sing high and loud, if we put our fingers on their nose or cheek-bones, we can feel them all vibrating and helping the sound, just as the chest does with the lower notes.

THE MACHINERY THAT WORKS TO PRODUCE LANGUAGE AND MUSIC

All this complicated machinery works with exquisite ease and skill and harmony whenever we speak or sing properly, and it produces either the universal language called music, which can express things, like joy or sorrow, that all can understand; or else it produces a special set of waves—and interruptions to the waves, which are called consonants, like p and m and t—which form a code or set of signals, called a language, just like the code used in ordinary telegraphy. Our native language seems "natural" to us, because we grew up with it; but really it is a quite artificial code, and we show this when we criticize any code we don't understand—though it is probably just as good as ours—and call it "gibberish." The only exception to this is that a few words in all codes are not really artificial, but are more or less imitations of the natural sounds—such words as whisper, and buzz, and tinkle, and coo, and so on. And we now have some idea of Jack's wireless telephone, its exceedingly great wonder, and the beauty of the way in which it works, although only a very small part of it has been described.

WHAT THIS STORY TELLS US

THE complicated lock of the present day is very different from the simple lock of a thousand years ago. The locksmith was an important man in the Middle Ages and made some wonderful locks, though they cannot compare with the locks of the present day. In our times the burglar and the locksmith are waging constant war, and the locksmith is making better and better locks, because the burglars have grown more and more skilful. The best locks of the present day afford almost perfect security, but some intelligent burglar may discover some method of opening them. We show you in the pictures some of the simplest forms of locks and also some of the more complicated. The best lock of these days is an interesting bit of mechanism, and the great vaults look as if they were too strong for any thief.

HOW A LOCK IS MADE

CONTINUED FROM 6317

THE lock was probably the first invention of man when he had become sufficiently civilized to desire to keep things. Before that, a hollow tree, a cave, a hut of branches were his dwelling, the skin of an animal protected him when cold; his food supply was drawn from the wild animals and fish in the woods and streams. When supplies ran short he could easily move, for there was nothing to move but his own body. There was nothing worth stealing and so there was no idea of property rights.

But he moved a step upward—he became a herdsman, a shepherd, a farmer, a mechanic in a rude way. He acquired pots, pans, kettles, weapons, tools, and all of them took so long to make that he valued them, and then there came to him the idea that he must invent a way to keep secure these things when he had to be away from his dwelling place, or was asleep at night. *The lock* was the result of his idea.

This was probably not more than 5,000 years ago, for the oldest traces that we have of locks are among the early Egyptians, and the next in order are of Chinese origin. There has been a great improvement in locks during the past hundred years, and to-day, in our country, the catalogues show more than sixty-five different kinds, each of these being for a special purpose. Thus we have air-locks, automobile locks, barn door locks, keyless locks, padlocks, car and switch locks, safe deposit locks, combination safe locks and many others.

At first the Romans and Greeks had very simple safeguards. A leather thong tied in curious knots around the handle of the door was the only lock, the knack of unloosing it the sole key. Then bars or bolts were used, and we can find in old writings how the ancients invented devices for controlling them. A leather thong with a loop or a hook on the end was inserted through a hole in the door, and this would move the bolt in the manner required. So the bolt was a rude lock in the same degree that the thong was a rude key. Later in their history they had real locks and keys, for keys and traces of locks have been found in the ruins of their camps and cities.

Some of the locksmiths of the middle ages did very beautiful work and made ingenious structures which, however, could not resist master keys, picks or shelter keys in the hands of skilful workmen. Some of these Middle Ages locks for great buildings are monsters in size, with keys two or three feet

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long. Some, made with crude hand-made tools, are beautiful miniature locks with keys no more than one-half inch in length.

THE LOCKSMITH AN IMPORTANT FIGURE IN THE MIDDLE AGES

In the sixteenth century, in Germany, Italy, France and England, the locksmith was a very important figure. He was an artist in bronze, iron and copper, his secrets were carefully guarded, his apprentices numerous, and distinguished by a special dress. Only a few of his locks have been preserved to us, but there are fine collections of keys in the museums of Europe, and from these we can grasp the nature of the lock and the beauty of its design. Little figures, escutcheons and armorial bearings, ornaments and piercings transform our little insignificant "opener" into an object of art. The day of factories had not dawned, and every lock and key was hand-made, and called for the devoted skill and patience of the master-locksmith or clever apprentice. Gone were the large sickle-shaped keys of antiquity, born on the shoulder of warden or slave. The lady of the house wore the keys of still-room, linen-chest, and plate closet, suspended from her girdle as an ornament, as well as an essential part of her dress.

Ornamental locks and keys are sometimes used to-day, but they are generally copies of those made in the sixteenth century, and, except for their mechanical difficulty, not superior in any way to these. The medieval locksmith devoted his skill to the ornamenting and elaborating of his locks; he did not make them secure against robbers. With the growth of banks, the increased use of money, the greater accumulation of wealth, due to the invention of machinery, strong need arose for greater means of security.

THE GREATEST OF THE MODERN LOCKSMITHS

In the first half of the nineteenth century was laid the foundations for the wonderful development of the lock-making industry which has taken place in the last fifty years. Perhaps the most widely known name in this trade is Yale. Linus Yale, Sr., started as a lockmaker about 1840. He made a brilliant record as a maker of bank locks, and died in 1857, after making his mark upon the trade. Then came Linus Yale, Jr., who invented the famous pin-tumbler locks, which are known all over the world. In this lock Yale went back to the ancient Egyptian lock for his principle, and made a small flat key instead of the cumbersome keys previously used. Many other improvements were made by Mr. Yale, who may be called the greatest of modern locksmiths.

No matter how difficult a lock may be, there is always a point of danger in the keyhole. Many devices to hide the keyhole, and even to take the place of a lock proper, have been tried, but the only one in general use is the combination lock. This is a lock in which the arranging of the internal parts in their proper positions is done from the outside by merely using numbers or letters in their right order. These numbers show on a disk which is usually marked up to 100. In this case the only key is a secret, which is to use the right figures in correct order.

These improvements made the combination lock almost unpickable. But still there was a secret, which, if known, would open the lock, and burglars used to force by torture the possessor of this secret to give it up. This was the origin of the famous masked burglars, which resulted in robberies amounting to millions.

THE TIME LOCK WHICH GUARDS THE VAULTS

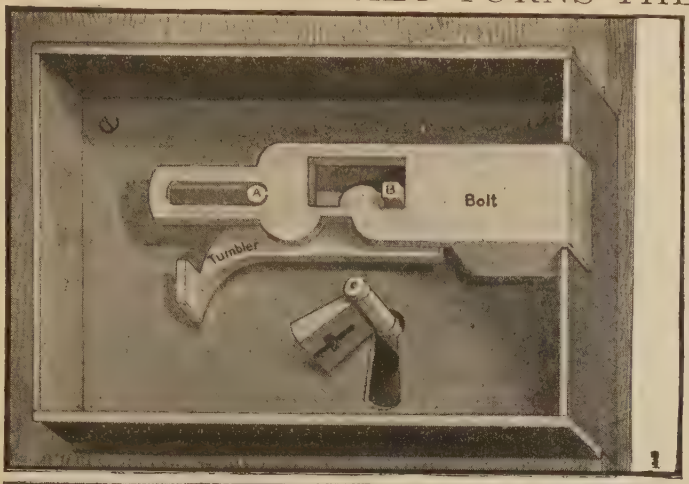
Then the inventors took another step and produced the time lock, which can only be opened at certain hours. Still the burglar found a way of introducing liquid explosives into the space surrounding the lock spindles. Many burglaries were committed in this manner.

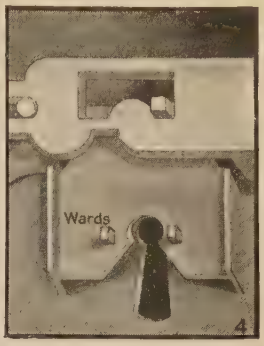
The problem was to make the introduction of these explosives impossible, and to do this the spindle-holes had to be done away with. This is done by a motor device working with a time lock. The motor throws the bolts and draws them back according to the setting of the time lock. And the door of the safe is as secure as any other part of it. The only way to overcome it is by such force as will destroy the whole structure.

We have to-day locks of many kinds, and it seems that the manufacturers have made our treasures secure. It has come to be a contest between the burglar and the locksmith, each trying to overcome the other. The locksmith seems to be gaining, for his locks are much more difficult to pick than those of former times.

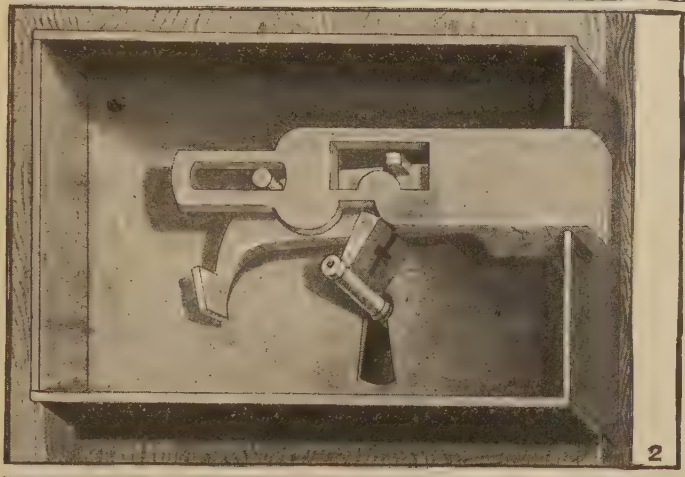
THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 6377.

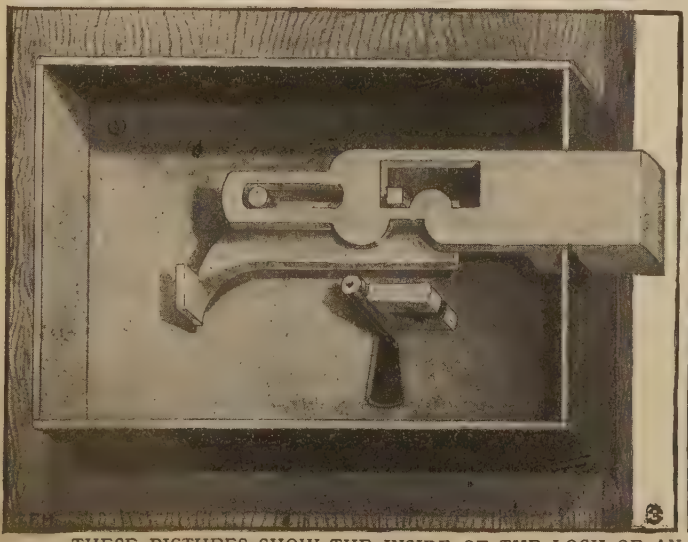
HOW THE KEY TURNS THE LOCK





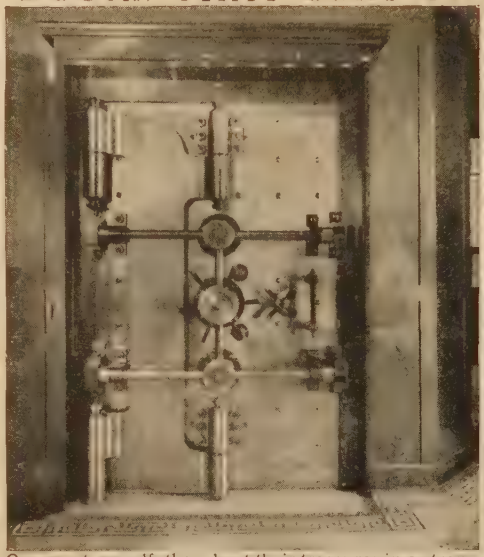
Locks are as old as civilization and were first made of wood. It was in the reign of Alfred the Great that locks were first manufactured in England, but there was little improvement in their construction until the end of the eighteenth century. Since that time there have been marvelous developments, until we have the elaborate and costly locks shown on other pages. Here we see how the common tumbler-lock works. This is the ordinary cheap lock found on cupboards and drawers. As shown in this picture, a metal "tumbler" works on a pivot, A. A stud, B, projects from the tumbler and fits into a notch in the bolt, preventing the bolt from moving either way. But when the key is turned, as seen in picture 2, the "bit," or flat part of the key, lifts the tumbler and enables the bolt to be pushed along as seen in picture 3. As soon as the key is turned right round the tumbler falls, its stud fitting into a second notch in the bolt and holding it firm. Picture 4 shows the wards, or projections, which prevent any key but one specially cut to fit the lock from turning round, and in picture 5 we see how the right key can be turned over the wards.



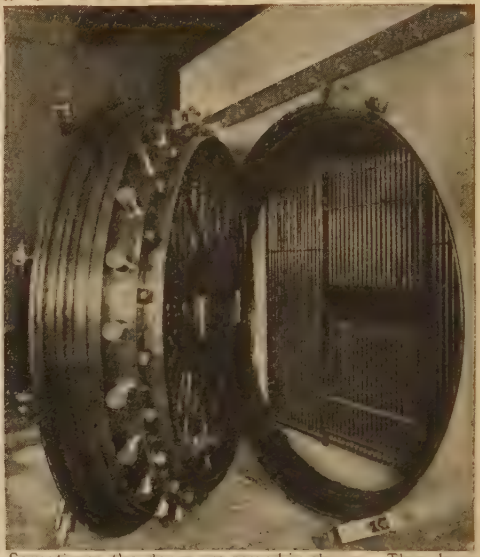


THESE PICTURES SHOW THE INSIDE OF THE LOCK OF AN ORDINARY DOOR

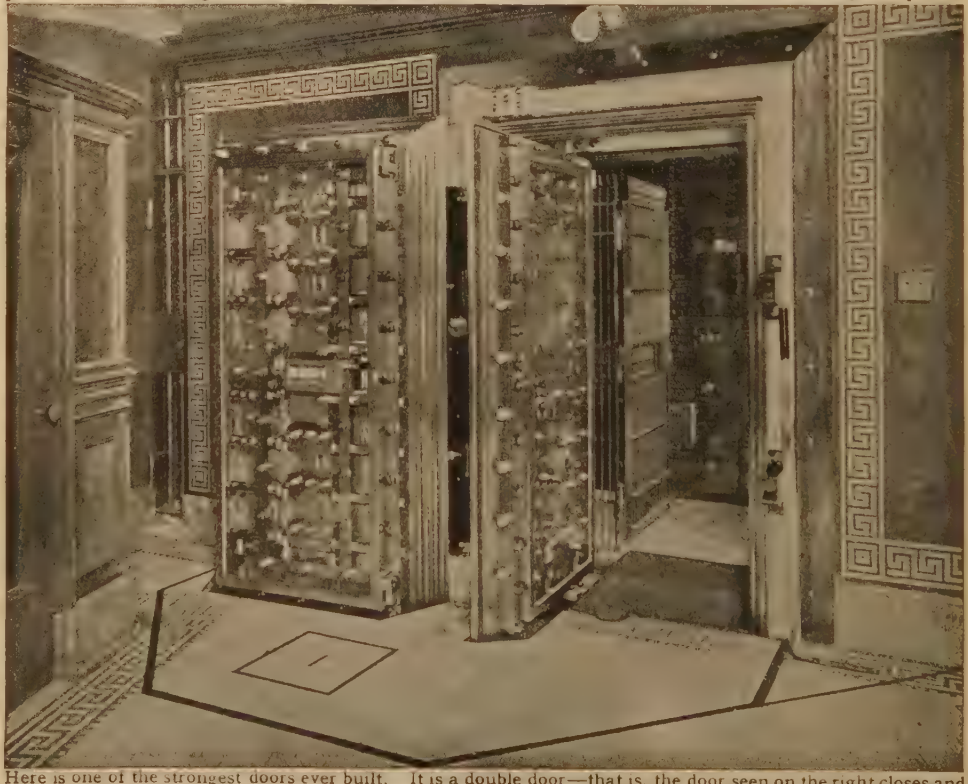
DOORS THAT COST THOUSANDS OF DOLLARS



Our great-grandfathers kept their treasures in a strong box made of wood bound round with iron. To-day a skilled burglar would laugh at such a treasure-store, and we build wonderful burglar-proof and fire-proof steel vaults, with doors like that shown in this picture, that often weigh more than twenty tons each.

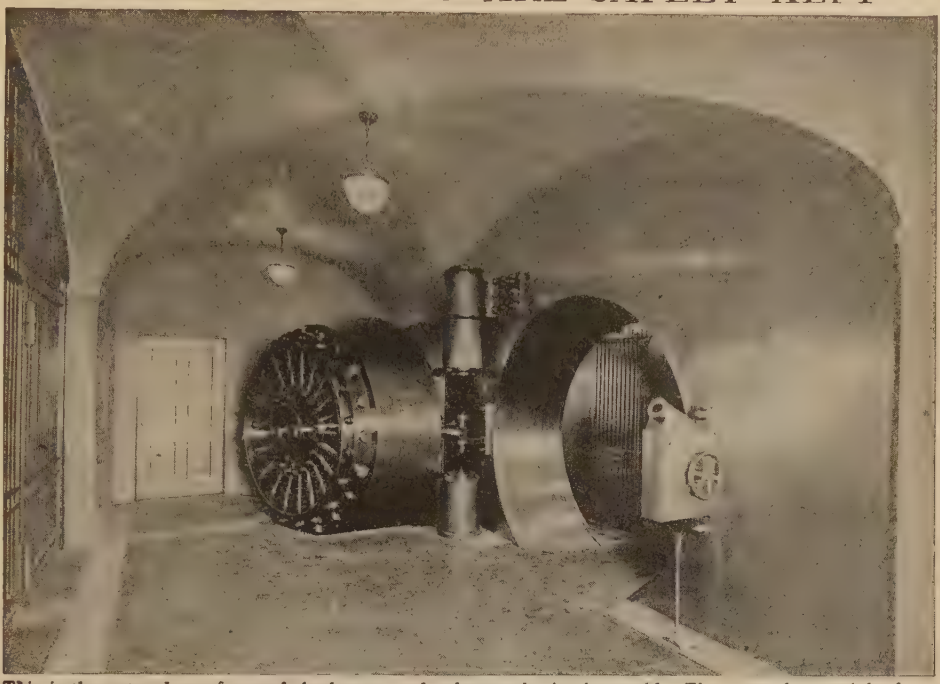


Sometimes the doors are round in shape. They have a marvelous system of bolts and fastenings, and the lock can be set to open at a certain time in the future. If once the door is locked, no human power can unlock it till the fixed time arrives. At the exact hour certain levers fail, and then the door may be opened.

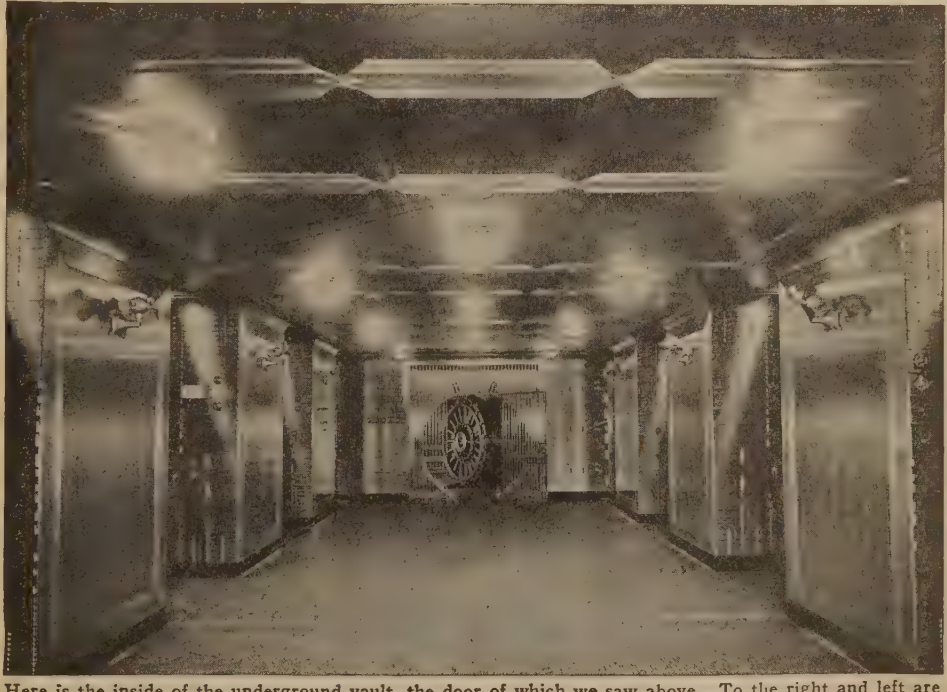


Here is one of the strongest doors ever built. It is a double door—that is, the door seen on the right closes and then the one on the left is shut over it. This door cost more than five thousand dollars. The key has a dial upon it with a number of letters that can be arranged in thousands of ways. Once the door is locked, it cannot be unlocked unless the letters on the key are arranged exactly the same as they were when the door was locked.

WHERE MILLIONS ARE SAFELY KEPT



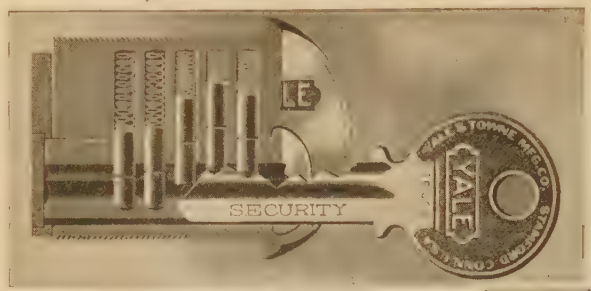
This is the outer door of one of the largest and safest vaults in the world. The great door weighs forty tons, yet swings easily upon ball bearings. Notice the great bolts around the rim which shoot past the rim. The tube to the right is a telescope through which only the person working the combination can see the dial, which is well-protected. The combination is worked by means of the wheel beside the box.



Here is the inside of the underground vault, the door of which we saw above. To the right and left are hundreds of boxes which are rented to those who wish a place in which to keep their papers, jewels and other valuables. Some boxes are opened by combinations and some by keys, as shown on other pages.

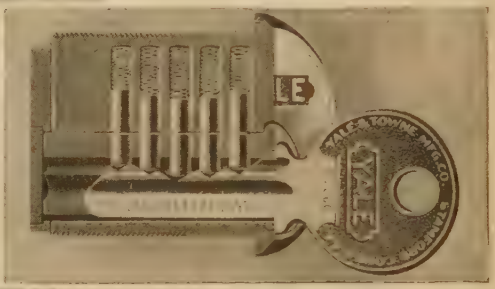
Pictures by courtesy of the Guaranty Trust Company.

HOW LOCKS WORK IN HOUSE AND BANK



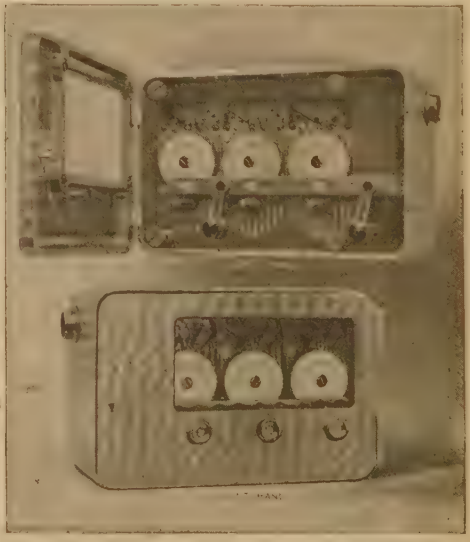
This picture shows a lock cut through the middle. Inside the lock are several little steel pegs of different lengths, called pin-tumblers, made in two or more parts. When the key is out they are pushed toward the bottom by the springs, and as part of each is in the outer cylinder and part in the inner, they will not allow the inner cylinder to turn around. The bolt is attached to the inner cylinder and moves with it. Let us push in a key and see what will happen then. It is easy to find a key which will slide into the key slot even though it was not made for that particular lock. The keys look much alike.

Here we see the proper key pushed all the way in. Notice each one of the little pins has been pushed up toward the top of the lock. Notice, too, that the division in each little pin comes exactly at the line between the inner and outer cylinders of the lock. You can see that a twist of the key would turn the inner cylinder inside of the larger one. The end of the cylinder away from the key is connected with the bolt and turns it. But if one of the notches in the key were a little deeper or a little shallower, one piece of the pin would be partly in one cylinder and partly in another and would not allow the inner cylinder to turn. A difference of one-fiftieth of an inch in the position of one pin will prevent the cylinder from turning.



This is how the lock would look if it were made of glass. You can see the inner cylinder turning, and can see the ends of the pin-tumblers as they are being turned inside the outer cylinder. The bolt is moved by the projection at the rear, which you see turning. It is very easy for the manufacturers to make the length of the tumblers or the depth of the notches just a little different. They say that 27,000 locks are made so that no key will unlock more than one. In the next 27,000 locks there is also one which your key will open, and so on. If you were to try every lock you saw you might find one your key would unlock, but it would take a very long time, and you might never find the duplicate.

Many people have a box in a safe deposit vault, such as we saw on another page, in which they keep valuable papers or jewels. The boxes are made of steel, and are easily drawn out when the doors are opened. Some of the doors require two keys, and some have combination locks.



A time lock is placed in the inside of a safe door. It can be set to open any number of hours after, and until that time has come, no one, even if he knows the combination, can open the door. Each of these dials can open the door. There are three for safety, as one might possibly get out of order.

Rockefeller Institute, A Home of Scientists.

SCIENTISTS WHO HAVE SAVED LIVES

CONTINUED FROM 6351

IN the olden days students of medicine studied with practising physicians. Often these students were college graduates, but often they were not, and when laws were made declaring that all students of medicine should attend a medical college, too often the teaching in these medical colleges was very narrow. The fact of the matter was that all it was thought necessary that a student of medicine should study was anatomy, the symptoms of diseases, and the medicines needed to overcome the ravages of illness. Most of them, of course, were what we call cultivated men. Many of them were learned in subjects which did not seem to have much reference to the science of medicine; but this was not thought necessary to their usefulness in their profession.

A change from this way of thinking came in the nineteenth century. In our day a student of medicine knows that he must study the laws of every science that has to do with life in any form, no matter how lowly. Moreover, the best doctors have learned to believe that the chief use of medical science is to teach people how to obey the laws of health so that they may keep well. In other words, they believe that it is easier to prevent illness than to repair the hurts that it has caused. Before they came to this point, doctors had to learn the cause of illness. The men of whom we have told you in the Story of Great Doctors, learned a great deal about the anatomy of the human frame, but they did not know much about the causes of illness, and the story of those who learned how to gain this knowledge is the story that we shall tell you here.

LOUIS PASTEUR, WHO LEARNED IMPORTANCE OF MICROBES

Strangely enough, Louis Pasteur, the man who first found the pathway to this new knowledge, was not a doctor of medicine, but a chemist. He was born in a little French town called Dôle, in the valley of the Saône, where his father, who had been a soldier in Napoleon's army, had settled down to his work as a tanner. While Louis was still very young, his father and mother moved to Arbois, where there was a good school, which he attended. Afterward he went to the college of Arbois, where the director advised him to prepare for the great École Normale, or normal school, at Paris, so that he might become a professor in one of the great colleges in France. His father and mother were determined to give him all the advantages they could, and when he was

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sixteen, Louis was sent to Paris to prepare for the École Normale, but he was so homesick that he fell ill, and had to go home again. Then he went to the Royal College at Besançon, where he took his bachelor's degree in literature. After he took his degree he was made an assistant teacher in mathematics, and while he taught, he prepared for the examination necessary to admit him to the École Normale. The professor in chemistry at Besançon, who was an enthusiast in his science, roused Pasteur's interest in it. However, when he went up for his examination at the École Normale, he only got a pass on his chemistry examination, and was so little satisfied with this that he refused to accept it. He went to Paris for a year's study, entered for the examination again the next year, and this time his name appeared fourth on the list. During this year of study, the influence of J. B. A. Dumas, whose lectures he attended at the Sorbonne, induced him to devote himself to chemistry. He entered the École Normale in 1844 and three years later took his degree in physical science.

In Paris, where he was appointed assistant in the laboratory at the Sorbonne, he made his first great discovery. A chemist, named J. B. Biot, had made experiments which led to discovery about the effect of light on the crystals of tartaric acid, and Pasteur in his study of the crystals completed the discovery and finished the work that Biot had begun. The discovery was very important, and when the experiment was carried out in his presence, Biot cried out, "My dear child, I have loved science so well throughout my life that this makes my heart beat fast."

As a result of this discovery of what he called left-handed tartrates, Pasteur was made professor of chemistry at Strassburg, and soon afterward he married Mademoiselle Laurent, who made him very happy in the life that they spent together. It was a very busy life, for the young professor constantly lived up to his motto, "Travailler, travailler, toujours"—"Work, always work." A few years after his marriage he was made dean and professor of science at the University of Lille, and though he had much teaching to do, he still went on with his search after the true answers to puzzling questions. One day he paid a visit to a brewery at Lille, and while he was there he became interested in the question, "Why does beer turn sour?" It was a question which had puzzled many wise men for centuries, but Pasteur answered it. We cannot possibly follow him through all the steps that he took, and the long hours that he spent in his laboratory before he found the answer. It is enough to say that, helped by the experiments he had already made with tartaric acid and fermentation, he found that beer and wine and milk are turned sour by the action of living organisms called microbes, and that these microbes swarm in the air around us. "Keep your air free from microbes or keep the microbes from your vats," he said, "and your milk and wine and beer will not turn sour."

He was now recognized as one of the greatest chemists of his time. He was appointed to an important post in the École Normale, and later on he was made professor of chemistry at the Sorbonne. Meantime he found out the nature of the disease among silkworms that had almost destroyed the silk industry in France; and he discovered the microbes which cause cholera, which was exterminating French poultry, and the disease called anthrax, which is fatal to sheep and cattle. Up to this time the disease called rabies in dogs was a cause of terror, for the bite of a dog that is ill with rabies is certain to produce hydrophobia in man. Pasteur became certain that this illness, too, was caused by a microbe, and did not rest until he found the microbe and discovered a way to make a person who had been bitten, proof against the ravages of this deadly little form of life. A campaign against rabies was immediately begun, and the disease has been almost wholly stamped out in some countries.

Pasteur lived to the age of seventy-three, and when he died in 1895 he was buried in the grounds of the Pasteur Institute, which had been founded for the treatment of hydrophobia. There is also a Pasteur Institute in New York, but happily there are now few cases of this dreaded disease for treatment in the United States.

Up to the time that Pasteur discovered the part played by microbes in the fermentation of beer, many had believed that it might have been caused by spontaneous generation, which meant that

life could come suddenly into being without cause. Pasteur's discovery quite upset this theory and set the whole scientific world talking, but only one man, Joseph Lister, saw what it meant to human life.

JOSEPH LISTER, WHO FOUNDED MODERN HOSPITAL TREATMENT

Joseph Lister, whose father improved the microscope, was born in Upton, near London, in 1827, and was five years younger than Pasteur. His family belonged to the Society of Friends, and the youth was educated at their schools and at University College, London. He took his degree of B. A. at the University of London, and stayed on at his college until he had taken degrees in both medicine and surgery.

When, as a young house surgeon, he went into a London hospital, he was appalled by the number of deaths that came from "hospital sickness," or gangrene. As we have told you in the story of the Great Doctors, a large percentage of patients died, who had undergone successful operations, and all the surgeons were in despair. Young Lister believed from the first that some means could be found to stop the cause of all this suffering, but except in maintaining greater cleanliness, he had made little progress, when he heard of Pasteur's discovery of the microbes that cause fermentation. That gave him the clue that he wanted. He had already come to the conclusion that hospital gangrene was caused by microbes, and study with his microscope showed him that this was the case. When he went to Glasgow, "hospital gangrene" was raging, and he set himself to stamp it out. Pasteur's discovery taught him that the microbes which cause gangrene could not grow in a wound unless they had been carried there. At first he believed that they came from the air, so he searched for an agent which would exclude air from wounds, and for this purpose he at first used carbolic acid to form a crust over the wound. Carbolic acid is a powerful antiseptic. It kills microbes and destroys the poison that they produce. But its action on flesh is very severe, and although by its aid wounds were healed without danger of gangrene, it left ugly scars. Therefore, instead of applying the acid direct to a wound, Lister began to use it as a spray, and through various steps he was led to the belief that the use of carbolic acid

Louis Pasteur in his Laboratory.

was not necessary. He learned that the microbes in fresh, pure air do no harm to a wound; it was the microbes carried to it from the hands, the clothing, the bandages or the instruments used in an operation that did the mischief.

Thus he laid the foundation for what is called aseptic treatment. That is, antiseptics, or microbe-destroying substances, are not applied direct to the wound. They are sometimes used on dressings, and by their use, and the use of great heat, sponges, bandages and instruments are made sterile.

From Glasgow, Doctor Lister went to Edinburgh University, where he succeeded Professor Syme. He stayed in Edinburgh for about ten years, and was then called to the College of London, where he was professor of surgery for nineteen years. In 1896, when he was an old man, he gave up his professorship, but went on with scientific study to the end of his life. Some time before he retired, he was made Sir Joseph Lister; a short time afterward he was made Lord Lister, and in 1895 he was elected president of the Royal Society, an honor that is shown only to the most distinguished men of science. He died in the year 1912, at the age of eighty-five.

THE MAN WHO FOUND X-RAYS

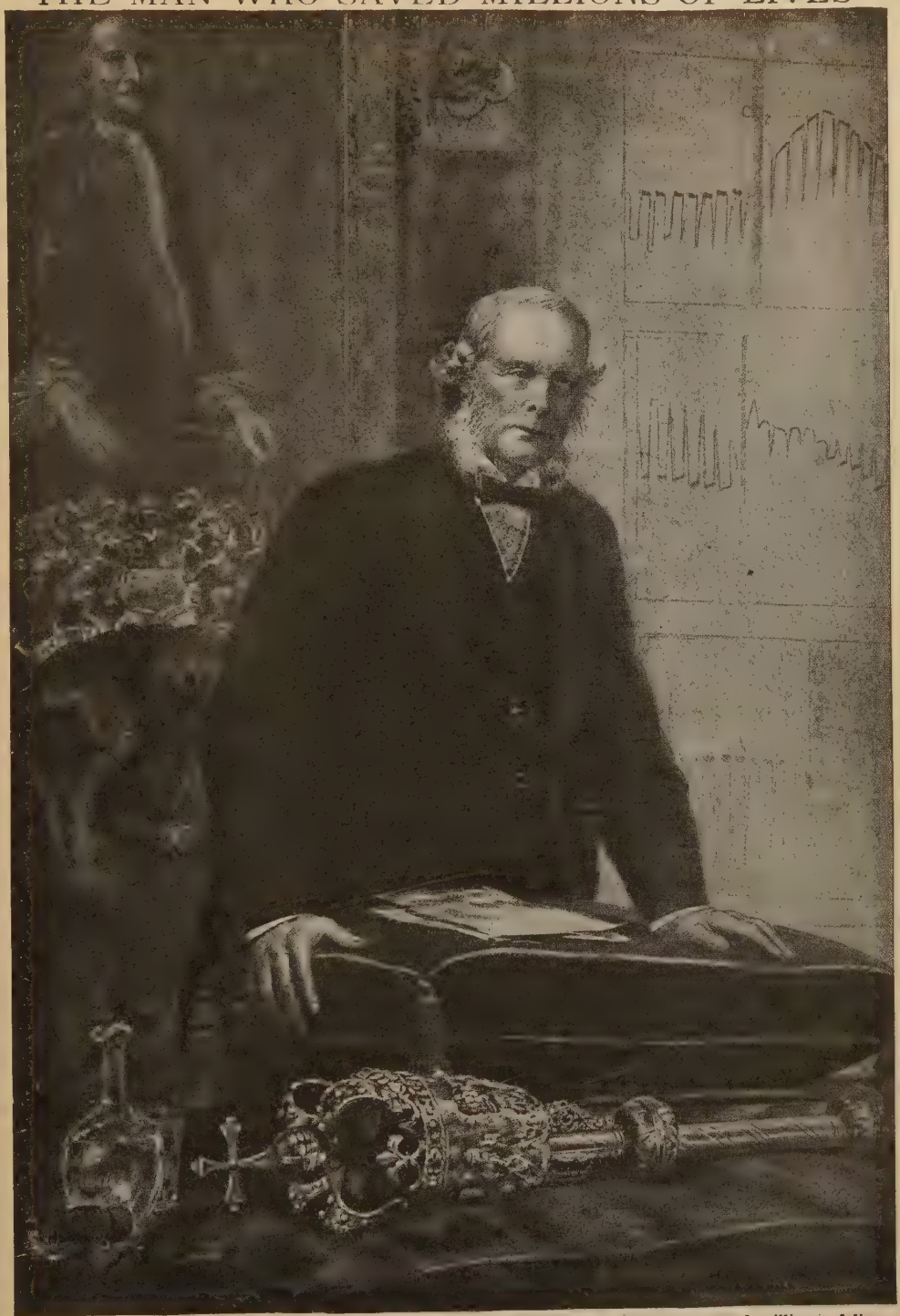
If you break your leg or your arm, or hurt yourself in some other way in the playing fields or gymnasium, the doctor will probably have an X-Ray picture taken so that he may be able to see what injury has been done to the bone, or if you have an aching tooth, the dentist will probably have an X-Ray picture taken to find out why it aches. These X-Ray pictures are wonderful things, but they have become so familiar to us that we have almost ceased to be curious about them. We are still less curious about the man who discovered the X-Rays. Nevertheless, he was a great scientist, and he has helped the work of doctors so much that he has a place here.

William Rontgen was born in Germany, in the year 1845, but was educated in Holland and at the University of Zurich, where he received his doctor's degree at the age of twenty-two. At the university he had turned his attention chiefly to chemistry, and soon made a name for himself in this branch of science. After he took his degree he taught at the universities of Wurzburg and Strassburg, and in 1879 was made professor of physics at Wurzburg. It was at this university that he made his great discovery. One day after he had been experimenting with a Crookes tube, he found that he had photographed a key which had been enclosed in a book. This discovery led him on to many more experiments, and the result of his work and study was a knowledge of how to produce the X-Rays that physicians and surgeons rank next in importance to the knowledge of anaesthetics and antiseptics. They are used to treat some kinds of growths on the body which are very like cancer. By their use the doctors can tell whether a badly swollen limb has been broken or has only had a lesser injury. They can find out just how much harm has been done to the lungs by tuberculosis, and by making a patient swallow a particular drug which the rays will not pass through, they can in some way find out whether an illness, such as cancer, has injured the stomach or other parts of the body. The rays will show whether or not a bullet has lodged in a wound, and perhaps no one person can imagine all these mysterious rays have done to lessen the pain of treating the wounds received on the dreadful battlefields of Europe.

DR. ROBERT KOCH FOLLOWED IN PASTEUR'S STEPS

One of the greatest of the men who followed in Pasteur's footsteps was Dr. Robert Koch, a German scientist, whom we know best in this country perhaps by his efforts to overcome the plague of tuberculosis. Doctor Koch was a native of Hanover, and was born in the town of Klausthal, in 1843. He studied at the University of Gottingen, and some time after he took his degree, he went with the German army to France during the Franco-Prussian War. When the war was over he settled down as a country physician. But as he rode about over the rude country roads to see his patients, his mind was busy with many things. He took up Pasteur's work on anthrax and spent many a long evening over his microscope. Pasteur, as we have read, had discovered the microbe that caused anthrax, and learned how to prevent the disease. Koch learned the whole life history of the microbes, and thus taught scientists how to study all microbes.

THE MAN WHO SAVED MILLIONS OF LIVES



It is probably no exaggeration to say that Lord Lister, the great English surgeon, saved millions of lives, for without his wonderful discoveries many of the operations that are performed in the hospitals of the world would result in death. He showed how the fatal poisoning of wounds, which nearly always followed operations before his time, could be avoided, and the whole world honors him for his splendid work.

He also did many things which it is interesting to us all to know. He discovered the microbe that causes cholera, the microbe that causes tuberculosis, and found out a way of preventing typhoid. After he had been made a professor in the Berlin University, men from all over the world went to study with him, and many of his students are now carrying on his work. One of these, a Japanese named Kitasata, found out the microbe which causes the bubonic plague, from

Dr. Alexis Carrel.

which so many millions of people have died in Eastern Asia, and which was responsible for what is known in European history as the "Black Death" of the Middle Ages. Doctor Koch went to Egypt to study cholera, and to East Africa to find out all he could about sleeping sickness and a cattle disease called rinderpest, of which we have read in another place, and he went to India to study the plague. He died in the year 1910.

DR. THEOBALD SMITH HELPED THE WORK OF PREVENTING DISEASE

He was helped in his work in typhoid and tuberculosis by the patient researches of Dr. Theobald Smith, who has done so many things and given so many ideas to other men that he might be called the "Scientist's Scientist." Doctor Smith was born in the city of Albany, in New York State, in 1859. He went to Cornell University, and after his graduation there he took his degree in medicine at the medical college in his native city. The next year he received an appointment, from the Federal government, in Washington, and after a while was made a professor in a university there. While he was at Washington, he found out a great deal about cholera in hogs, and the result of his study laid the foundation for all that Koch and other men afterward discovered about the prevention of diseases like typhoid, diphtheria, and meningitis. Men and women who are likely to be in places where they may be infected by these diseases are inoculated with vaccines which make their bodies strong against these diseases, and this treatment, which has been given the long name of anaphylaxis, has saved many thousands of lives. Doctor Smith found out that the cattle tick, of which we read on page 3364, caused Texas fever. This was a great discovery, for it enabled the men of whom we have read elsewhere, to learn that mosquitoes are responsible for yellow fever and malaria, and the tsetse fly for sleeping sickness. He also discovered that tuberculosis in man is not quite the same disease as tuberculosis in cattle. Doctor Koch agreed with him in this and for a time thought that the milk of a cow who was ill with tuberculosis could not give the disease to a person who drank the milk, but unfortunately Doctor Koch was probably wrong, and at least it is much wiser to run no risk in such a serious matter. Doctor Smith is now at the great Rockefeller Institute, an institution in New York where a band of students are constantly at work striving to find out all about the human frame, and the enemies that attack it. At the head of it stands Dr. Simon Flexner, also an American, whose work is of particular interest to young people. For years he bent all the powers of his mind toward finding out the cause of infantile paralysis, which has hurt many thousands of children for life, and he found out that it is caused by the tiniest germ that ever has been known.

DR. ALEXIS CARREL, THE GREATEST MEDICAL SCIENTIST OF OUR TIME

One of the best known scientists of our time is Dr. Alexis Carrel, a French-

man, who was born near the city of Lyons, in the south of France, where his father was a silk manufacturer. His school and college days were spent at home, and he graduated from the University of Lyons, where he took his degree in medicine in 1900. Five years later he became a member of the staff of the Rockefeller Institute, and much of his work has been done at that great institution.

It is difficult to tell of the work of this one man, it is so amazingly wonderful. Before his time, the flow of blood from an artery that had been cut could be stopped, but ever afterward the artery would be useless. Doctor Carrel found out a way in which the artery could be joined so that it would be able to carry on its functions as before. He discovered that as long as it can be kept alive, the stuff of which our bodies are built can be made to grow, just as microbes can be made to grow, and this makes it possible to take a vein from a part of the body where it has not much work to do and put it in the place of an important vein that has been destroyed, to transplant bones from one part of the body to the other, and to perform many other wonders in surgery that have been done for men wounded in the Great War.

Now Dr. Henry Drysdale Dakin, who is not a doctor of medicine, but a doctor in chemistry and biology, had discovered that a solution of hypochlorite of soda will kill the microbes, or bacilli, as they are more often called, no matter how many there are in a wound. Doctor Carrel learned of this treatment from Doctor Dakin, who was working with him among the wounded, and at once began to apply it. To make it successful, however, it is necessary to keep the wound always moist with the solution, and to keep the solution away from the healthy skin, which it would injure. So Doctor Carrel made a clever arrangement of tubes which run down from the jar of solution above the patient's head, and every two hours a nurse goes round the ward and lets the solution run down these tubes into the wound. When all the bacilli have been killed the wound heals up, and the patient quickly recovers.

Doctor Koch, the Discoverer of the Tuberculosis Germ, at Work in his Laboratory.

This is a picture of Professor William Rontgen at the moment when he discovered that the action of the mysterious X-Rays, produced by electricity in the Crookes tube at the left of the picture, had actually photographed a key through a solid substance. He had laid a book, with the key closed in it as a book-mark, on top of a photographic plate. In the course of an experiment the X-Rays were produced, and the key photographed on the plate. This discovery has been of great service in surgery.

A hamster—a rat with cheek-pouches—enjoying its long sleep through the winter.

THE WINTER SLEEP OF ANIMALS

CONTINUED FROM 6327

A BUTTERFLY was born one day, and saw a world beautiful with sunshine and flowers and fruit. The air was sweet with perfume, the flowers were heavy with nectar, the world was a paradise for butterflies. And our butterfly danced and floated in the sunlight, and retired in the evening to the shelter of a splendid tree. The butterfly laid its eggs, and died. Its whole life lasted but a few days. To such a butterfly our world is always sunny and warm; always full of flowers and fruit. Now, how many of us realise that there are animals which live far longer than man lives—animals which know nothing but summer?

In a famous zoological garden an animal was shown, a few years ago, which had slept about two hundred years in all. The animal in question was an elephant tortoise, the age of which at the time of his death, was over 350 years. Now, he would sleep at least twelve hours out of each twenty-four during the summer. But that did not satisfy him. As soon as the dull days of autumn came, the tortoise puts himself to sleep, not for the night, but for the whole winter. And during all his long life—a life as long as the lives of six men—he never saw a winter. This tortoise was not different from the rest of his family. Every year he hibernates—that is to say, he passes the winter hidden away, and in sleep.

The long sleep of animals in the winter is one of the wonderful precautions which Nature provides for her children of the wilds. We might say that it is natural for a cold-blooded animal like the tortoise to go to sleep for the winter; that it is so sluggish an animal at the best that to change to a state of complete torpor or sleep is but a little step. But animals much more active than the tortoise go to sleep for the whole of the winter months.

When we read of travelers in the Arctic regions, we know that in the depth of winter they may come across the great Polar bear. Naturally, then, we say to ourselves that Polar bears do not hibernate. We are both right and wrong. Male Polar bears probably do not hibernate. They take their nightly sleep as we take ours, but they are always active in pursuit of food during the day. The mother Polar bear, however, goes to sleep for the winter. She lies down in the snow, and lets the soft, feathery mantle cover her.

Her warm breath keeps open a sort of funnel for her through which she can breathe. Far down in the snow as she may lie, there is always open a way to the upper air from which she can draw supplies of oxygen to keep her blood pure. And there, through all the winter days and nights, she lies. Winter comes and goes, and in due course the spring-time arrives. Then forth from her bed of snow comes the mother bear. And

A POLAR BEAR SLEEPING THROUGH THE WINTER

when she does come out, she does not come alone—she brings with her a baby bear, or, it may be, two baby bears, whiter and fatter and jollier than the finest Teddy bear that ever became lord of a nursery.

HOW BEARS PREPARE FOR THEIR WINTER SLEEP

But let us not forget that there are many other bears besides those of the Arctic regions, and many of these also hibernate. They do not bury themselves in the snow, but they find some other refuge. It may be the hollow trunk of a tree, or it may be some snug cave. All hibernating animals must, before settling down for the winter, find some suitable place. It would be of no use for them just to lie down the moment Nature told them that the hour was at hand for them to begin their winter sleep; they would die of cold, like ourselves, if they did not take precautions. They seek the right sort of shelter—some enclosed place, where the cold wind will not blow, and where the temperature will not vary. A mysterious knowledge which they have spurs them to do more than find out this shelter. As the autumn draws near, the bears eat and eat and eat, not because they are desperately hungry, nor because they are greedy. They eat that they may become fat. During the winter months, when they are lying asleep in their retreats, they require some sort of nourishment to retain life in their bodies. That nourishment they find in the masses of fat stored up in their bodies by the process

of heavy feeding which they have undergone in preparation for their long fast in the winter months.

The bear knows that he must be fat at the beginning of autumn when he tucks himself up in his cave or tree, or he will die, and so well does he understand this that, if times have been hard with him, and he has not put on a great mass of fat, he will not risk going off for his winter sleep. Woe to us if we come across him at such a time. We ourselves are bad tempered if we lose our sleep, but we are not as bad as the thin and angry bear which wants to sleep. That is the time when he is to be avoided. Another time is when he wakes up from his winter sleep. Then he is a bad-tempered fellow indeed. All the fat in his body has been absorbed during the winter; he is lean and hungry, and his fur is also matted and unlovely, and he is as much out of temper as any bear can be. But leave him alone, and he will come round. He will find roots, tender shoots of trees, honey, perhaps a few animals, and in a month's time his fur will have become sleek and fine.

A BADGER IN ITS WINTER SLEEP

THE RACOON THAT SLEEPS IN A HOLLOW TREE

In the cold parts of the country the racoon goes to sleep quite early in the autumn. He sleeps all through the coldest of the winter months; but very early in the spring he wakes up and leaves his hollow tree, even though the snow may still be deep on the ground.

The badger belongs to a species which, in cold lands, passes a good deal of the winter in sleep. In this it is like the brown bear. Brown bears and badgers partly hibernate—that is to say, they have long spells of winter sleep, without passing all the winter in this way. These animals now and again bestir themselves to go out and get food. Forth they go, get a meal as best they can, then return to their lair and sleep for weeks. Even the common hare hibernates to some extent. It can lie and snooze for days, or even weeks together, in the snow in the fields, and feel none the worse for the adventure. The scientist would not call this true hibernation, for the hare, like the Polar bear, keeps open a funnel in the snow by means of its warm breath. The scientist insists that an animal, to hibernate, shall be in a state of complete torpor; that it shall be to all appearance dead.

An animal in this state is one of the greatest mysteries in the world. The breathing practically ceases, the heart beats faintly; the temperature, or bodily heat, of the animal sinks to the temperature of the place in which it lies. Great cold numbs us, and makes us fall asleep—to die. But great cold awakens the hibernating animal. The sleeper is recalled to life, as it were, by a sudden fall in temperature, and if it is not able to move about and get food, or in other ways increase the heat of its body, it will die, frozen to death, like the weakest of us. A rise in temperature will also recall the unconscious animal from its deep slumbers.

THE DEEP WINTER SLEEP OF THE BAT

The bats hibernate in the truest sense. If we were to take a bat when it is awake in the middle of summer and plunge it into water, we could soon drown it. But when a bat has fallen into its winter sleep we can place it in a bucket of water and keep it there for nearly half an hour, and it will know nothing about it, and be none the worse for the drenching. If the European hedgehog is disturbed while it is asleep in summer it will give a little snort or two, wriggle, then coil itself up tighter than ever, being quite awake.

When its winter sleep has started, however, we can do as we like to it without awakening it. It seems scarcely to breathe. When we try to rouse it, it will give one or two snores, then breathe

feebly a few times, and become as quiet as if dead.

It is said that in winter we might handle some deadly snakes without the least risk of danger to ourselves, but others, awakened from their torpor, would be as deadly as in the summer-time. There is plenty of opportunity for studying hibernation if we keep reptiles, for in cold climates they all go to sleep for the whole winter, provided that the conditions in which we keep them resemble the conditions under which these animals live when at large. Numbers of rattlesnakes are often found in the winter closely coiled together as we see them in the picture in the story of the Great Snake Family. It is believed that they sometimes travel long distances to find a suitable cave in which to sleep. But who would care to handle rattlesnakes, even though they were asleep? Some of the deadliest vipers when aroused in the winter are said to be quite harmless; their "venom" is not poison at this time; but as other poisonous snakes are poisonous winter and summer, we should not care to experiment with the rattlesnake when he is waking up in a bad temper.

A young bat, life-size, picked up in the Surrey lanes at Ewell, near Epsom.

BATS DURING THEIR WINTER SLEEP

WHERE THE FROGS SPEND THE WINTER

We can get ample evidence as to the ways of hibernating animals from our common neighbors, the frogs. These sleep soundly through the most severe winter, but they are too wise in the choice of their hiding-places for us to find them easily. When chill autumn comes the frogs betake themselves to their ponds, dive down to the bottom, and bury themselves in the mud. Should we by any chance come upon a hibernating frog, he will swim lazily away, but will soon settle down again to resume the nap which we have disturbed. The fresh-water tortoise buries itself in the mud of its pond. It is easy for any cold-blooded animal thus to pass the time in sleep. A reptile does not have to undergo so violent a change of temperature as a warm-blooded animal. A lizard makes itself at home for the winter in various places — under stones, among dead leaves, in holes and trees, and so forth. Land tortoises bury themselves for their winter sleep, and so do the common toad and the wood frog.

Lower in the scale of life we find the same habit practised. Slugs go to sleep in holes in the ground, and worms make their winter beds deep enough in the ground to escape the effect of frost, but in some places their sleep is not very profound. Snails, however, go into a very deep sleep, and they take a double precaution to protect themselves. They have their holes in the ground, but they are skilful enough to make a special protection for themselves. They close up the hole in their shell, but, as they must still have air, they leave open a tiny hole in this covering. It is hard to say how long

they can support life in these conditions. A snail from Egypt, called Helix desertorum, lived, gummed to a board, for four years. It then revived, and lived in a museum for two years after awakening. Hence we need not be surprised to learn that fresh-water snails have the power of hiding away and remaining without food all the winter months. Some fishes hide themselves in deep holes or in the mud, and remain in a torpor while winter lasts.

Many insects hibernate. But here we come to a parting of the ways, as it were. Are we to call the life of the chrysalis during the winter a hibernation? Some insects lay two or three lots of eggs in the course of the summer. The earlier lots will all be hatched during the same summer, but the later will remain either as eggs or as chrysalises during the time of cold and absence of food. That is true of flies and many moths and butterflies. But we see butterflies on warm days in winter. True, there are some butterflies in temperate climates hardy enough to brave the cold days of winter. During frost and fogs and snow and rain they hide away in warm places, depending for life on the store of nourishment contained in their fragile bodies.

A HEDGEHOG IN ITS WINTER SLEEP

A DORMOUSE IN ITS WINTER SLEEP

When the sun shines and the wind is warm, out they come, fluttering like winged sunshine in the wintry air. A very little suffices to feed them, and we are all glad, for the sight of a butterfly in winter is cheering.

It has taken the experience of thousands of generations to teach animals that it is necessary for them to go to sleep during the winter. Those animals which hibernate know their business better than we can teach it to them. Certain bats go off to bed for the winter at the end of July, when their food is still plentiful. That seems unaccountable to us, but that there is a good reason for it we may be sure from the fact that year after year the bats retire at about the same time. Probably the reason is that they have had all the food necessary to build up their bodily strength; to continue to feed might be useless, perhaps even harmful. Some bats migrate southward, and so escape the colder climate of the north.

WHY THE SQUIRREL MAKES A STORE OF FOOD

Let us glance at the methods of some animals that hibernate on less severe lines. Our pert and handsome friend, the squirrel, is one of them. We already know how he stores up food for the winter, then tucks himself up in bed and goes off to sleep. But warm days of winter wake him up, or the action of his heart and muscles, which consume the fat stored in his body, does so. He wakes up, pops out to his store of nuts, and makes a good meal, then curls himself up for another long snooze in his delightfully warm little abode.

It is said that some of our marmots actually make hay and store it in summer, so that they may have abundant food during the winter. There are many species of marmots, and we can find something to admire in the wise ways of each. Those whose homes are in Europe and India make but little preparation, for they know that they will be able to leave their underground towns early in spring, and come out for food. Others lay up store for a long stay underground, so that as often as hunger awakens them they may have sufficient food in their little barns without having to go out and face the cruel weather. The woodchuck,

the best known of our marmots, makes no provision for the winter. He comes out of his burrow quite early in the spring time, and an old superstition says that if he sees his shadow, he goes back to sleep for six weeks more, knowing that the warmth will be slow in coming. Of course there is no truth in this old story.

The chipmunk or ground squirrel knows that winter is a hard time, during which he must shut himself up in his subterranean city. How well he provides against that time we may know from what was found in the winter home made by four chipmunks. There was a quarter of a pint of wheat, a quart of nuts, a peck of acorns, two quarts of buckwheat, a lot of corn, and a quantity of grass-seed. And this was to feed four fat chipmunks in the little intervals of wakefulness throughout the winter. Need we wonder at all that when they come out from their long winter sleep the chipmunks are as fat as butter?

WHY THE ANIMALS HIBERNATE

It is from necessity, then, not from choice, that the animals of which we have been talking take these long winter sleeps. Long as it has taken them to learn that they must accustom themselves to such a mode of life, they very soon shake off the attractions of a winter-long sleep if their conditions of life alter. We can keep a frog awake all the winter. We have only to keep him moist and warm and feed him, and he will not want to sleep night and day.

We know that men kept in a temperature equaling that of their own bodies, and doing nothing, can go without food for a long time. It is only at the beginning that hunger and thirst are felt; afterwards there is generally only a desire to sleep. Of course, if a man were moving about, or doing work, he would soon die; but keeping still in a warm place with pure air, a man can live many days without food or water. If a man can do this, we need not be surprised that cold-blooded animals like reptiles and amphibia and fishes can pass a winter without food.

THE BEAR THE ONLY FLESH-EATING ANIMAL THAT HIBERNATES

It is not so easy for an animal which needs occasional meals to hibernate. It is hardest, of course, for the flesh-eating animals. They have never yet learned to store up food for the winter, except in the case of the Arctic fox, which does hide the bodies of captured animals, to be eaten when he wakes up now and again during the winter. It is wonderful that even a little animal like the Arctic fox should be able to make this provision. Of course, it would be impossible for a great bear to lay aside enough to keep himself fed during a long winter. He knows that, so he goes to sleep entirely, and eats nothing, making himself, by so doing, one of the greatest wonders of animal creation. Hibernation is a fascinating subject, and there is still a great deal to be learned about it.

ANIMALS THAT SLEEP THROUGH THE SUMMER MONTHS

The summer sleep of some animals is not such a simple matter for us to study. We have all noticed that on a hot summer day a heavy, drowsy feeling steals over us, and old people usually go to sleep during the afternoon. Sitting in front of a hot fire on a winter afternoon or evening will also have this effect. Well, the same sort of thing happens to animals, but with them it is a sleep for a season. Reptiles are most commonly affected in this way. The crocodile makes himself a bed deep down in the mud, and lets the sun bake the latter into a hard crust round him, and there he stays until rain comes to swell the river in which he makes his home. Then he breaks out of his muddy cradle, and is alert and hungry.

Snakes hide themselves in the same way, but let us beware of disturbing one. But the sleep during summer is not confined to the reptiles; the mud-fishes make a place for themselves in the mud. The water of the river dries up; the mud hardens until it is like stone, but the fish lies asleep inside, absolutely unharmed. And while it is in that state we can dig it up in its muddy case and bring it over the ocean, and wash it out of its earth into a tank in one of our conservatories, and it will live and flourish.

It is necessary that some animals should go to sleep to avoid the hardships of winter; it is just as necessary that others should sleep during the scorching heat of summer, for the blazing sun of tropical lands burns up the vegetation, and dries up the streams, so there would be nothing for them to eat if awake.

The Cullinan Diamond, and the Largest Stones Cut from It.

THE PRECIOUS STONES

CONTINUED FROM 6362

WHAT is your birthstone? If you were born in January, do you wear a garnet? Do you know the origin of birthstones, and the difference between the various stones? If not, then tuck yourself into a big chair by the fireplace, and read this story. Of course we shall have to start out saying, "Once upon a time," for that is the way stories begin.

Once upon a time, long ago in the first century, a writer, Josephus, told about the virtues of various stones, and described the breast-plate of the high-priest which is mentioned in the Book of Exodus (Exodus 28, 17-19). The stones in this breast-plate were set in four rows, with the names of the children of Israel engraved, one on each stone. The modern names of these stones are generally thought to be the following: carnelian, chrysolite, emerald, ruby, lapis lazuli, onyx, sapphire, agate, amethyst, topaz, beryl and jasper. The breast-plate had not only these twelve magical stones for the twelve tribes, but also the twelve signs of the Zodiac.

Perhaps the custom of wearing birthstones grew out of this, for some of these stones are still used in this way. It is only recently that people have thought about wearing birthstones, and the custom is supposed to have started in Poland among Hebrew gem-traders, though no one knows just who chose the gems for the different months. It is an attractive idea, for the stones are durable, and the sentiments attached to each have been handed down for many years, and by many races and peoples. The lists have differed from time to time and in different places, but the one given below is now generally accepted.

STONES FOR EVERY MONTH IN THE YEAR

There is at least one stone for each month, and each has a special meaning. For March, June, August, October and December, there are two stones. The garnet is for those born in January. Its meaning is constancy. The violet amethyst is for February, and is said to bring contentment to the wearer, and is the stone for sincerity. March is one of the five months which is favored with two stones. For this month we have the bloodstone, which means courage, and the aquamarine as second choice. Those born in April should wear a diamond, which typifies innocence. For May we have the emerald, and the wearers of this stone are supposed to be successful in love. June claims the pearl, which stands for virtue and health; and also the moonstone, which brings good luck.

Those born in July should wear the brilliant ruby as it brings nobility of

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mind. August claims both the sardonyx, which prevents misfortune, and the peridot. To those born in September, the sapphire brings success and prevents evil. The opal, once called a bad luck stone, is now supposed to bring happiness and wealth to those whose birthday comes in October. The tourmaline is also a birthstone for this month. November has the yellow topaz, which stands for friendship and success. December is favored with two stones—the turquoise, which is said to prevent accidents, and the lapis lazuli.

How stones are cut into the forms we know

Before going on to describe separately each stone in our list let us learn something of the way stones are prepared for us. Very few stones are set as they are found, because they need to be cut and polished to show their beauty. Otherwise they might seem dull, irregular and opaque. The practice of cutting stones is very old indeed. The Phoenicians may have learned the process from the Assyrians. Stones may be cut in many different forms, as the cabochon, table, step, rose or brilliant. They may be cut in curved surfaces like the star sapphires, or cut in facets (small faces), like the diamonds. Before the fourteenth century they were usually given curved surfaces; later the transparent gems, except the garnet, were cut with facets. When the garnet was cut with curved surface it was called a carbuncle. Many of the opaque and translucent stones are cut "en cabochon," that is, with smoothly rounded tops, as opals, moonstones, and turquoises.

Diamonds are sometimes cut in rose pattern, that is the facets are triangles of nearly the same size. When cut in this way the diamond is not so beautiful, and has little fire. Therefore, only the less valuable stones are cut after this fashion. The table or Indian pattern is used especially for emeralds, rubies and sapphires. The top and bottom of the stone are ground off, and its sides are so ground that the finished gem resembles two pyramids with the apexes flattened, placed base to base. The flat top is called the table and the bottom the culet. The widest part is called the girdle. Years ago, diamonds were cut in this way.

The cut which gives the greatest brilliancy, is called the brilliant. It has fifty-eight facets, thirty-three above including the table, and twenty-five below the band or girdle around the stone at its widest point. The setting grasps this girdle and holds the stone in the ring, pin or pendant. The facets are of various forms and sizes, and have different names, as star, skew, and the like. It is said that the art of cutting diamonds into facets was discovered in 1456. If there is a flaw, that is a dull spot, in the rough stone, it may be possible to split or saw it off. The stone is then gradually rounded by rubbing against another diamond, and the fine powder and fragments that result are carefully saved for use in the final polishing.

The next process is that of cutting the facets. This work requires great care and skill. The stones are nearly buried in soft metal, and the parts left uncovered are rubbed against each other. The hands of the workers are protected by leather gloves. First the top or table facet is made, then the culet, or flat bottom facet, is formed. The long facets extending from the table to the edge are next fashioned, and at last the small facets.

Then comes the polishing against an iron wheel with diamond dust and oil. This operation is very slow, and a moment's carelessness may ruin a fine stone. When finished the stones are sometimes boiled in sulphuric acid to remove any bits of dust or oil. Only very skilled workmen can attempt the difficult task of cutting a valuable diamond.

What is meant by the word carat?

Do you think a carat is a vegetable? It is not even related to the carrot, though they sound very much alike. The carat, as a weight, is used for weighing precious stones. The word carat is said to come from the name of a bean, which was once used in the East as a weight. Nowadays jewelers do not use the beans, but the word carat is still kept. A little more than 151 diamond carats make an ounce. There is another kind of carat used in measuring the fineness of gold. It is a twenty-fourth of an ounce. If your ring is marked eighteen carat, it means that eighteen parts are pure gold and six parts are of some other metal.

Imitation and artificial stones of different kinds

Perhaps you have seen in cheap shops rings or pins with glittering stones, which

are offered for a low price. Of course, you know that such stones are not real. They are generally made of various kinds of glass and soon grow dull. We know, however, what chemical elements are found in all the real stones, and men have tried to manufacture them. In some cases they have had success. They put the different things of which the stone is made into a furnace and melt them together. If done very carefully, in some cases they get a stone so nearly like that found in nature that only an expert can tell the difference. Excellent rubies can be made in this way. Men have also succeeded in making diamonds, but they are very small and cost more than the natural stones.

A doublet is an imitation stone made up of two parts—the top part consisting of a thin layer of a real stone of little value attached by cement to the base, which is made of nothing but colored glass. A doublet sapphire, for instance, would have the top a real stone, and for the base, a piece of blue glass. The upper part, as it is a real stone, will stand the test for hardness but the base shows its softness.

The triplet has a thin layer of a real stone on the top and on the bottom, too, but a piece of colored glass is inserted between at the girdle, where it is hidden by the setting. This imitation may be discovered by putting the unmounted stone in oil, or in boiling water or alcohol, when the stone will fall to pieces.

Imitation pearls can be made of small hollow glass beads formed by blowing. These blown pearls are coated on the inside with a preparation, called essence de Orient, made from the scales of a certain fish. Some imitation pearls are composed of a solid glass ball coated with a varnish, and they are very beautiful.

THE GARNET, THE STONE FOR THOSE BORN IN JANUARY

The garnet, which is the birthstone for January, is usually a dark-red stone, but it may be yellow, green, brown, or even black. It varies in hardness and in size as well as in color, for some stones are like a grain of sand, while some are much larger; some of them will scratch a piece of quartz, others may be scratched by quartz; some are opaque, and some are transparent. The name comes from the Latin, granatus, meaning seed-like, because the stone resembles the seed of the pomegranate.

If you find a piece of rock with little roundish, red grains scattered through it, you may rightly think they are garnets. The little crystals at first sight look round, but if you dig several perfect ones out of the rock you will notice that they have smooth faces. Sometimes they will have twenty-four faces. When rocks decay, the garnets that are contained in them fall out and are washed into the streams. Garnets are as hard as quartz, and can stand being thrown about by the waves. The little red stones you may find are not the precious ones. The clear red garnets come from Bohemia, Ceylon, Peru, Greenland and the Cape of Good Hope. In America, some stones have been found in New Mexico and Arizona.

Garnets are something like the ruby, though cheaper, and were called by the ancients, carbuncles. When they are cut like the half of an egg, they are still called carbuncles. The stones are often so beautiful that they may be cut into gems of two or three carats each.

THE AMETHYST, WITH ITS VIOLET COLOR

The amethyst is a variety of quartz, and varies in color from a light bluish-violet to a clear dark purple, and sometimes is nearly black. The dark reddish-purple is the most highly prized. Amethysts have been found in many parts of the United States, but the best stones come from Brazil and Ceylon. Those found in Yellowstone National Park, in the Amethyst Mountains, Texas, in parts of North Carolina and Georgia are the best in this country. The value of an amethyst depends somewhat upon the fashion, for at times these stones have been considered very valuable.

THE BLOODSTONE, FOR THOSE BORN IN MARCH

If you see in a store window a ring with a queer-looking green stone with dashes of red, you may wonder what it is. Probably it is the bloodstone, a variety of jasper containing red streaks. This stone was used as a talisman by the ancient Egyptians and Babylonians. Now the stone is used especially for signet-rings. The Spaniards used to cut the bloodstone into a heart-shaped amulet, because they believed that it was a remedy for heart trouble.

The bloodstone, or heliotrope, as it is sometimes called, comes from Siberia and also from some parts of the United States,

especially Georgia, Oregon and California. In very ancient times, it was used for the engraving of sacred subjects. The figure was so placed that the red spots were made to represent drops of blood. It is sometimes called St. Stephen's stone.

THE AQUAMARINE, ALSO A STONE FOR THOSE BORN IN MARCH

If you should find a piece of a green glass on the beach, it might be merely a part of a broken green bottle, or it might be a real stone which is called aquamarine because it looks so much like the greenish-blue color of the sea-water. It is really a variety of beryl. Aquamarine is found in many different localities, but most of the best gems have come from India, Russia, South America, Siberia, and Ceylon. Aquamarines of various hues have been found in the United States, especially in California, North Carolina, Massachusetts, Maine and Connecticut. Possibly the largest and finest aquamarine ever seen was found in 1901 by a miner in Brazil. This stone although it shows shades of green and blue is so clear that one may look through it as though it were a piece of glass, and yet it is a big piece of crystal, nineteen inches long, weighing 243 pounds.

THE DIAMOND, THE KING OF PRECIOUS STONES

An uncut diamond is not beautiful; in fact it resembles a rough gray pebble. The diamond is composed of only one element, pure carbon, a very common substance. It is surprising to find that the coal in the grate, and graphite in the lead pencil, are exactly the same thing chemically as the diamond, but the crystals are arranged in a different way. The diamond, the emblem of fearlessness, has been called the "king gem;" the pearl, the emblem of modesty and purity, has been called the "queen gem." In the Sanskrit, the diamond is given names meaning thunderbolt, fire, and the sun. In the Greek, it was called "adamas," unconquerable, from which word comes our word adamant, meaning hard.

The three important sources of supply are India, Brazil and South Africa. Up to the sixteenth century, India was the exclusive home of the diamond. Recently it has been found in the United States, but most come from South Africa. Diamonds are grouped under different names according to their color. The most valuable ones are those said to be of "the first water." The blue "Hope" Diamond is probably the most celebrated colored diamond, but rose, black, green, mauve and salmon shades are also known.

A file cannot scratch a real diamond, though it will affect an imitation. A diamond will show up very clearly if placed in a glass of water, but an imitation will look dull. If you hold a diamond over a black dot on a piece of white paper, the speck will show clearly. If the dot is blurred or is multiplied, then the stone is not genuine. There are other tests, but the supreme test is its hardness, for the diamond is the hardest stone.

THE BEAUTIFUL GREEN EMERALD FOR MAY

The emerald is a grass-green variety of beryl found especially in Colombia, South America. It is also found in Egypt, Russia, Australia, and some have been mined in North Carolina. In Mexico, the emerald was given the name "quetzalitzli," meaning the stone of quetzal, because its beautiful green color resembled the golden-green of the Mexican bird, the quetzal, sometimes called the long-tailed paradise-trogon. The plumes of this bird were often worn by the rulers in Mexico and in Central America, and so the emerald came to be regarded as a royal gem. We are glad we have a name for this stone that is not so odd as the Mexican name.

Some people used to think that the emerald was a charm against illness if it was worn as an amulet around the neck. One of the most celebrated rings in history was a large emerald set in gold and worn by Alexander the Great, who had his portrait engraved on the stone. The very finest emerald in Europe now, belonged to the former Emperor of Russia. A perfect emerald is rare, and so is worth as much as a diamond of the same weight.

THE PEARL, THE QUEEN OF GEMS, FOR JUNE BIRTHDAYS

If you are eating oysters on the half-shell and find some day a dainty little silvery pebble, you may have found a real pearl, though it is not likely to be worth much, as the best come from a kind of oyster which is not good for food. Something that does not belong there, perhaps a parasite or a tiny speck of sand, gets inside of the shell. The oyster tries to cover it over. This covering of nacre or pearly substance is the same material

used in lining the shell. Most pearls are white or cream-colored, but some are found having a gray or even a pink shade, and others are rose-colored. You may read about pearl fishing in another volume of our book.

Although the pearl is not a stone, it is classed with the most valuable of precious stones. It is very delicate and loses its beauty if carelessly handled or exposed to great heat. When it is placed in cold storage for safekeeping, it should have a piece of damp sponge near it. If a pearl is cut across the middle and examined under a microscope, it will show a number of layers or rings, and so resembles an onion in structure. Pearls vary greatly in size and shape. Some are shaped like a button, others are pear-shaped, but the best are perfectly round like a ball. Pearls were known to the Greeks and Romans long before the diamond was known. A beautiful white pearl called the "Pelegrina," as large as a pigeon's egg, weighing 134 grains, is now in Moscow. The largest pearl known is in the South Kensington Museum in London and weighs three ounces. A very rich man in this country owns a string of thirty-seven pearls which cost over $40,000.

The pearl oyster grows in warm waters in many parts of the world. The finest pearls come from the fisheries of Ceylon, but they are found around islands in the Pacific and Indian Oceans, in the Gulf of California and in the Caribbean Sea. Some of the mussels in the streams of the United States yield "fresh water pearls" which are beautiful but not so valuable as the real pearls from salt water.

THE MOONSTONE, THE SECOND STONE FOR JUNE

In India the moonstone is considered a sacred stone, and is supposed to bring good fortune. Whenever it is displayed for sale there, it is placed on a yellow cloth, as yellow is a sacred color. Nearly all the moonstones come from Ceylon. In Colombo, moonstones may be bought for a few pennies each, as they are very common there, but in this country they are valued much more highly.

The moonstone, which is a variety of feldspar, has a milky blue color, and a soft lustre, and is usually cut "en cabochon" with a rounded top, or cut in the shape of a ball. There is an old superstition that says that a moonstone held in the mouth will help a person to remember things which he had forgotten.

THE RUBY, WHICH GLOWS FOR JULY

The ruby, the birthstone for July, when fine and large, is the most valued of all stones. The very name of the ruby, called in the Greek, "live coal," in the Latin, rubeus, or red, indicates its color, a vivid red, which sometimes has a tinge of purple or a pale rose-red.

Most of the real rubies have come from Upper Burma. A few have come from the gem sands of Ceylon; some are found in Siam; others come from Madras and Mysore, India; and a smaller number from Afghanistan and Australia. Those in the United States have been found in North Carolina and Montana. The oriental ruby is often mentioned in Eastern legends and old romances. Several stones which are not rubies at all have been called by the name. Though so much valued it is the stone which can be made artificially with the greatest success. Most of the artificial stones show tiny bubbles, if they are examined closely.

THE SARDONYX, WHICH BELONGS TO AUGUST

The sardonyx, as its name indicates, is composed of layers of sard and onyx. The layer of sard is of a deep brown or reddish color, while the onyx should have the delicate pink color of the finger-nail. These stones are often used for cameos. One of the most famous stones in the world is a sardonyx cameo upon which Queen Elizabeth had her portrait cut, and which she gave to the Earl of Essex as a pledge of her friendship. When sentenced to die, Essex sent this stone to his cousin to be delivered to Elizabeth. Through some mistake the stone reached the hands of the Countess of Nottingham, an enemy of the Earl, who refused to deliver the ring, and as a result the Earl was beheaded.

THE PERIDOT, THE ALTERNATE STONE FOR AUGUST

The beautiful olive-green peridot is sometimes called "chrysolite," meaning golden stone, or "Job's tears," from its shape, and sometimes it is called "evening emerald," because of its bright green color at night. The stone is usually cut "en cabochon," but a "table step-cut" form is considered more valuable. As the stone is rather soft and easily scratched, it is not so often worn in rings as in pins.

Most of the best stones come from a little island called St. John on the west coast of the Red Sea. A few very fine peridots were found not long ago in the ruins of an old house in Alexandria, where they had probably been buried with the idea that they would bring good fortune to the building. Some light-green stones come from Queensland, and some bits of peridot have been found in the United States.

THE SAPPHIRE, GENERALLY BLUE, BUT SOMETIMES YELLOW OR WHITE

The sapphire, the birthstone for September, is the symbol of truth and virtue. This royal stone, the "gem of gems," as it is called, has always been popular with lovers of precious stones, because of its beautiful blue color. Most sapphires are of a clear blue shade, varying from a pale blue to a deep indigo. We may, however, see some stones which are white, some which are yellow, and even some of a greenish-blue hue. Except in color, the sapphire is like a ruby. Both stones are composed chiefly of a substance called alumina. The stone does not show up very well at night.

Ceylon is famous for sapphires. In the United States they have been found in Montana and Idaho, but the largest number of these stones come from Siam, which supplies more than half of the world's sapphires. In Siam the stones are found in clay which contains gravel, and usually at a depth varying from two to twelve feet. The gravel and sand containing the gems is carried to a stream in large bamboo baskets, with a point at the bottom. The basket is then placed in a current of water, and its contents carefully washed, until the clay has been separated. As the gems are heavier than the common stones, they settle at the bottom of the basket, and are then picked out by hand. Garnets and zircons are often found near the sapphires.

THE OPAL, ONCE THOUGHT TO BRING ILL LUCK

The opal was the favorite stone of Queen Victoria, and she always loved this white fire-flashing stone, the symbol of hope. This gem shows many colors: the green of the emerald, the soft purple of the amethyst, the red of the ruby and the blue glints of the sapphire. The play of colors in this stone is caused by tiny fissures crossing in all directions, and is not due to any coloring matter, as in the case of nearly all other colored precious gems.

Most of the opals come from Hungary, but some are also found in Australia, Ceylon, Iceland, the Hebrides, Ireland, Mexico and the United States. It is said that when the opal is first taken from the mine, it is colorless and transparent, but after it has been kept in the light for a time, the violet shade appears, followed by the other hues.

One very famous stone was called the "Burning of Troy," on account of the tiny tongues of red flame it showed as if it was on fire. There are some very fine opals from Hungary among the crown jewels of Austria, and the crown jewels of France. Recently some very beautiful black opals were found on Lightning Ridge in a desolate part of Australia, called the "Never-Never Land." No two of these stones are exactly alike. Some show flashes of blue glowing flame, others have intricate patterns of molten green and twinkling red. A stone which appears to have dancing flakes of sapphire blue, when turned to another position in the light will show flashing gleams of yellow and red. As they are rare, the black opals are very expensive.

THE TOURMALINE, WITH ITS MANY COLORS

If you saw a piece of tourmaline in the granite home where it lives, you might think that it was a stick of pink candy. But tourmaline is not always pink, for it sometimes has almost as many colors as the rainbow. Some varieties are brown, some are red, some are blue and some are even black. In the stones found in Brazil, the core is often red, surrounded by white, with a green shade on the outside. Specimens from the mountains of Southern California show a green core, surrounded by white, with red on the exterior, which is just the reverse of the Brazilian stones. Delicate shades of green, violet and brown are sometimes combined in specimens from Ceylon and Pegu. The island of Elba produces a variety of tourmaline whose crystals are black at one end, red at the other, with yellow in the middle.

The tourmaline is found in many parts of this country, especially in Connecticut, Vermont, and New Hampshire. It was first found in Maine by two boys who were interested in minerals. They were coming home from a walk when they

saw something green near the foot of a tree. They picked up a few pieces of this green stone, but as the snow was falling very fast, they returned home, and later came back to the spot, where they found a number of very beautiful crystals. This mine is like an Aladdin's cave, for over forty varieties of this stone have since been found there.

There are several varieties of the tourmaline: the rubellite, a pink or red shade; the indicolite, a blue color; and the achroite, which is colorless. When cut into settings for rings, the red tourmaline looks so much like a ruby that it is often mistaken for one. One of the Saxe Holm stories tells of finding a wonderful tourmaline.

THE TOPAZ, THE STONE FOR THOSE BORN IN NOVEMBER

Yellow is the usual color of the topaz, but not all are that color. In fact, you will have no difficulty in matching a topaz with your dress, for the topaz is found in an almost endless variety of colors. The finest stones are of a bright citron shade, at times showing a clear gold color. Most of the gems come from Brazil, but they are also found in many other parts of the world, as England, Russia, Saxony, Australia, and the United States. Sometimes a large white topaz is mistaken for a diamond, and the crimson topaz has been substituted for a ruby, while the green shade has been called an emerald and the blue shade has been mistaken for a sapphire.

The largest topaz on record was found in Brazil a few years ago, and weighed in the rough state eleven and one half pounds. It took several months to cut this huge stone. The Maxwell-Stuart Topaz is a stone which was first thought to be a piece of quartz, but later proved to be a topaz weighing 308 carats.

THE TURQUOISE, WHICH MEANS THE TURKISH STONE

The turquoise has been praised by many poets. We may remember, in Shakespeare's Merchant of Venice, when Jessica goes away with her father's jewels, old Shylock grieves greatly over the loss of his turquoise, which he would not have lost for "a wilderness of monkeys."

Centuries ago these stones were mined by the Egyptians in the desert of Sinai. They were found in Mexico before the discovery of America. A great many are now cut in America and shipped to Europe. The best turquoises come from the northeastern part of Persia, where the mines have been worked for thousands of years. The name of the stone indicates that it came from Turkey, as the finest kinds came from Persia by way of Turkey. The beautiful blue turquoise is supposed in Tibet to bring good fortune and to guard against the "evil eye," and is thought to change its color and grow pale in sympathy with the health of the wearer.

The turquoise is similar to the opal. Like the opal, it is found filling up cavities in the interior of rocks. Some beautiful stones of robin's egg blue and some of green, as well as azure, have recently been found in New Mexico, Arizona, California, and Nevada. Now imitations of beautiful blue color have been made and they can hardly be detected without destroying the stone.

THE LAPIS LAZULI, THE SECOND STONE FOR DECEMBER

The lapis lazuli, or azure stone, is a rich blue stone which shows specks of iron-pyrites of golden hue, and is far more intense in color than any other opaque blue stone. For many centuries this stone was considered very valuable and was prized especially for its color, "blue with golden spots." By the Greeks and the Romans, this stone was known as the sapphire. Pliny called it the "blue sky flushed with stars." It is not always a deep blue shade, but varies from a pale blue or greenish to a pure green. The best come from Afghanistan, on the Oxus River in Asia; although some stones are found in Persia and China. To obtain the stone, the rock must be split by fire.

SOME FAMOUS STONES AND THEIR STORIES

In the Museum of Natural History, in New York City, there is a wonderful collection of over 4,000 specimens of gems, and every stone there has a special interest. In the display cases, one may see the most nearly perfect large sapphire known; the largest piece of gem beryl; the finest opal found in Mexico, which is a fire-opal of 17¾ carats; a garnet cameo, which was for centuries in the Vatican; a series of 166 sapphires in many colors, and many other large stones. There is a Persian turquoise engraved with a whole chapter of the Koran, containing over two thousand

words. In another case one may find specimens of the new stone, first found in California, in 1903, which has been called kunzite, for the gem expert, Dr. George F. Kunz.

The first native sapphire ever cut in the United States is also there. A large blue sapphire, weighing 163.93 carats, came all the way from Ceylon to find a place in the exhibit. The largest and most perfect star-sapphire known, showing the six-rayed refraction, may also be seen, and the famous "Star of India" sapphire, weighing 543 carats, has a prominent place. In the topaz section, there is a well cut gem of 615.90 carats from Ceylon. There are several specimens of amethysts from North Carolina and Maine, and a royal purple stone of 142 5-32 carats from the Ural Mountains. In the diamond series, there are several American crystals, one of 15.78 carats from Wisconsin.

In one room, one may see copies of the most famous diamonds of the world. One, the Cullinan, found in the Premier mine in the Transvaal, South Africa, in 1905, is the biggest stone known. The glass model of the Sancy shows the size of this stone, which is 53 carats. Other stones are the blue Hope diamond, which weighs 44⅛ carats, and the Regent of France, which weighs over 316 carats.

STORIES OF THE FAMOUS DIAMONDS—THE ORLOFF

Large diamonds are very rare. In fact there are only about a hundred stones weighing over thirty carats in the world. Some of these big stones have had strange histories of romance and intrigue. The stone which is known as the Orloff was once an eye in the statue of a god in a Brahman temple in Mysore, but a French soldier, who was stationed as a guardian of the temple, picked out this beautiful eye, and ran away with it. It was stolen from him by another thief, the captain of an English ship, who disposed of it to a Jewish dealer in London. It was finally sold to Prince Orloff, who presented it to Catherine II of Russia. It was in the royal sceptre, and was prized as one of the most beautiful of all the stones in the world. It is about the size of a pigeon's egg, of a yellowish shade, and weighed 194 carats, and was valued at $1,649,000. Since the Russian Revolution it has been lost to sight, though strange rumors about it have come to us.

THE HOPE DIAMOND, A BEAUTIFUL BLUE DIAMOND

This diamond is interesting as it is the largest blue diamond known. It is called the Hope diamond because it belonged to a famous banker by that name. It was really one of the most valuable diamonds in Europe, though it weighed only about 44 carats. Little is known of its early history, though some people suppose that it was stolen with other stones from the French crown jewels at the time the Regent diamond was taken. It was found again, and later shown among the French jewels at the London Exposition in 1851.

THE EXCELSIOR AND THE REGENT DIAMONDS

Before the discovery of the Cullinan diamond, the Excelsior, weighing 971¾ carats, and measuring two and one-half inches in length, was the largest stone known. The man who picked it up while loading his truck at the mine, was rewarded with $2,500 and a horse and saddle. From this stone were cut twenty-one brilliants.

A large, round stone weighing 410 carats was found in an Indian mine in 1701 by a negro slave, who concealed the discovery and fled with it to the coast, only to meet with a tragic end, for on board the ship he was robbed and then thrown overboard. The captain who committed this double crime sold the diamond, and spent the money recklessly. The stone had a varied history until it was bought from a Parsee merchant by Thomas Pitt, the English governor of Madras, grandfather of the famous William Pitt. He sold it to the Duke of Orleans, Regent of France, for whom the stone was called the Regent. It was stolen in September, 1792, during the French Revolution, and buried with other valuable jewels in a ditch to prevent any one from finding it. Twelve years later, one of the robbers told of its hiding-place near the Champs Elysees, because he was afraid to offer the stone for sale. All the thieves were sent to the scaffold, except the one who told where it was hidden. This treasure, you see, has been the cause of much unhappiness as well as joy. It has been recut so that it weighs only 136 carats, and is now among the French state jewels. Some of our readers may have seen it when they were in Paris.

THE KOH-I-NUR, SOMETIMES CALLED "THE MOUNTAIN OF LIGHT"

The story of the Koh-i-nur begins as far back as the year 1304, when the Mogul emperor captured it, though some people say that the stone can be traced much further back. This stone, which has been called "The Mountain of Light," is the oldest diamond that is known, although it is not the most valuable. For many years the stone passed from one ruler to another, and was the source of endless misfortune to its possessors. It may have been one of the diamonds in the famous Peacock Throne of Shah Jehan, the great Mogul sovereign. This throne of solid gold, valued at $30,000,000, was so called from the figures of two golden peacocks, whose feathers were set in rubies, emeralds and other gems.

The Koh-i-nur was finally presented to Queen Victoria in 1850. It was badly cut at first, and its weight has been much reduced by recutting. It now weighs 102¾ carats. It took many days to cut this big stone. Now the stone is kept in Windsor Castle, and a model is shown in the Tower of London.

THE SANCY, WHICH HAD AN EXCITING HISTORY

The history of the Sancy, also called the Sphinx, is bewildering, as several stones have been called by that name. The original Sancy was a beautiful almond-shaped Indian diamond, covered all over with tiny facets, and weighed 54 carats.

It is impossible to follow the journeyings of this stone, for it had a habit of hiding away for long periods. It was said to have belonged to Charles the Bold of Burgundy, but it was stolen from him by a soldier, who prized the golden box in which the famous stone was kept. Thinking that the bright box was more valuable than its contents, he tossed the white stone in the road. After a time he began to think that the contents of such a lovely box must be of value, too, so he returned to the place where he had thrown the stone and picked it up. Not wishing to keep it, he sold the stone to a priest for a florin, which is about fifty cents, and the priest later sold it for about seventy-five cents.

For a hundred years the stone was lost to sight. Then it appeared again, and in the possession of Nicolas de Sancy. Queen Elizabeth is said to have owned it, and then it appears in the possession of Louis XIV. It was stolen in 1792, when the regalia disappeared. The king of Spain owned it, or a similar stone, and then it disappeared, although some claim that it is in India now. The difficulty seems to be that no one is quite sure whether the same stone is meant in all these stories. All of the stories cannot be true of one stone, and yet it does not seem possible that there could be several diamonds so large.

THE CULLINAN, THE LARGEST DIAMOND EVER FOUND

If you saw a stone the size of your fist, you would not call it a diamond, would you? On the contrary, you might think it was merely a piece of ice, or perhaps a lump of quartz. You will not see a stone that size every day, for there has been found only one diamond as large as your hand and as heavy as a pound and a third of sugar. This huge stone, called the Cullinan, was three times as large as any known diamond, and weighed, before cutting, 3,025¾ carats, and measured four by two and one-half by two inches. It was purchased by the Transvaal government for the sum of one million dollars, in 1907, and was presented to King Edward VII, of England, on his birthday, November 9, 1907. Three years after it was found it was cut in Amsterdam and divided into nine large stones and a number of small brilliants. Two of the stones, by far the largest brilliants in existence, have been placed, the one in the sceptre, and the other in the crown of the British regalia. At the head of this story we show the original stone, and the largest stones cut from it. The larger, known as Cullinan I, weighs over 516 carats, and the smaller, called Cullinan II, weighs over 309 carats. Some people believe that the original Cullinan was only a part of a much larger stone, which may be found some day.

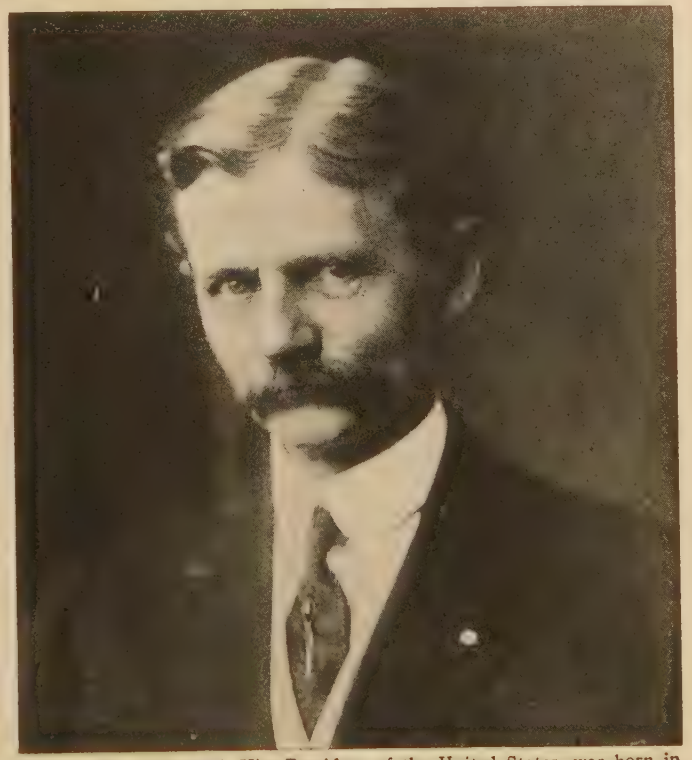
There are many other large diamonds in existence, such as the Star of South Africa, the Stewart, the Porter Rhodes, the Tiffany, and the Jubilee, but none of these has a particularly exciting story. They are simply beautiful stones. One sometimes wonders how much diamonds would be prized if they were as plentiful as quartz. They are beautiful, to be sure, but would men and women wear them so proudly, and struggle so hard for their possession, if any one could get them?

PRESIDENT WILSON AND VICE-PRESIDENT MARSHALL

6386

Woodrow Wilson, President of the United States, was born at Staunton, Va., December 28, 1856, studied at Princeton, the University of Virginia and Johns Hopkins, and taught in Bryn Mawr College, Wesleyan University and Princeton. From 1902 to 1910 he was President of Princeton, was Governor of New Jersey 1910-13, and was inaugurated President of the United States March 4, 1913. He was re-elected in 1916, and again inaugurated on March 4, 1917. He is the second Democrat elected to this office in over a half-century, and the tenth president to be elected twice.

Photographs by Brown Bros.



Thomas Riley Marshall, Vice-President of the United States, was born in North Manchester, Indiana, March 4, 1854. He was graduated from Wabash College, studied law and practised until he became governor of Indiana in 1909. He was elected Vice-President on the ticket with Mr. Wilson in 1912, and assumed office March 4, 1913. He was again elected in 1916. As Vice-President his chief duty is to preside over the Senate, but if the President should die he would become President of the United States. This has happened five times in the history of the country.

WHAT THIS STORY TELLS US

CHILDREN usually do not think much about government. They know that they live in a republic but they seldom know much about it. Because they think so little about government, our schools are generally organized as absolute monarchies, where the teacher makes all the laws. Below we give you the story of a method which gives the pupils a great deal to say about the government of their school. It is called the School Republic, and tells you what has been done in many states of the Union, and in some foreign countries. The plan allows the pupils to make all the common rules and regulations which are necessary for the orderly conduct of a school. Schools, cities or states cannot exist without government of some sort, and the only question is as to who shall do the governing. This interesting story tells what students have done.

THE SCHOOL REPUBLIC

CONTINUED FROM 6275

DID you ever hear of a School Republic? Probably not, for they are not very common, and you can hardly guess what the words mean, for your own school is probably not organized in that way. You are sure that republic has something to do with people governing themselves, and in few schools do the pupils have that privilege. You probably think that it is the business of the teacher to govern the school.

School republics are schools where the pupils make the rules of conduct, try any one of their number who has broken one of them, and perhaps punish him. Such school republics are organized in several countries of the world, and more and more people are growing interested in them. Let us see why this is true.

WHY ARE PEOPLE SO MUCH INTERESTED IN GOVERNMENT?

Since the Great War began everybody has been talking more about government than ever before. We have learned that the kind of government people have makes a great deal of difference in the way they behave. If they have a government in which they have no part, they cannot prevent their rulers from doing many evil things if they desire to do so, and the rulers can even compel the people themselves to take part in doing such things too.

Our soldiers and sailors are fighting in the war "to make the world safe for democracy." This means, in part, that the people must have the right to govern themselves, and that no one must dare to harm them. Democracy comes from two Greek words which mean the "rule of the people." Now the people may have a great deal of power, even though they have a king, and they may not have any at all. The people of Canada say that they are a part of the British Empire, over which King George V rules, but the people of Canada rule themselves. On the other hand, the people of some kingdoms do not have anything to say about how they shall be governed. So you see what you call the government of a country does not always tell how much the people have to say about that government. Republics generally allow the people more freedom than kingdoms, but this is not always true.

People often say that a country cannot have a republic, or that the people cannot have power because they do not know how to use it. That is what is the matter with Russia, they say. The people of Russia do not know enough to govern themselves, and that is the reason why there is so much confusion in that unhappy country. Peo-

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ple sometimes point out the republics of San Domingo and Haiti, and say the same things about them.

How can self-government be learned?

Perhaps they are right, but we can ask, how are the people of these countries ever going to learn to govern themselves if they have no practice? One cannot learn to play the piano, or to spin a top, even, without practice. We see grown men taking a great deal of time, and making many bad shots, learning to play golf. One might tell you how to play baseball for years, but if you never had a ball in your hands during that time, you would not learn to play the game. You might know a great deal about it, but that is not the same thing, as you would soon find out on the field.

We do not have good government in all our states and cities, even though the people here have the right to govern themselves. One reason is that many of our grown people either do not know much about their government, or else they do not take the trouble to see that good men are elected to office. We cannot have good government unless the citizens take interest in it, and see that the laws are obeyed.

What grown people say about children

Now grown people often complain of children and say that they do not control themselves. Unfortunately what they say is sometimes true, and children often annoy their elders and do themselves much harm, because they do what they think they would like for the minute, without thinking whether it is the thing which will give them, and those around them, the most happiness in the end. But are the children always to blame?

For one, I am quite sure they are not. Children have very little practice in learning how to govern themselves. They are told to do this, or to do that; they are told not to do this, or not to do that. Sometimes they are told one thing one day and the opposite the next day. They cannot understand the reason, and they sometimes come to think that there is no reason in it. When they disobey or forget, sometimes they are punished, sometimes not. Some parents are foolish enough to punish too little, as well as to punish too much. There is no doubt that wrong-doing should be punished.

The form of government in the school-room

The same thing is true with teachers, for the school-room is generally an absolute monarchy. An absolute monarchy is, you know, a form of government where the ruler has all the power, and the subjects have nothing to say about the government. If the monarch is very strong there is good order, while if he is weak there is a great deal of trouble. The subjects break the laws, and no one is happy.

Now some wise men thought over the fact that we have a republic here in the United States, and that the boys and girls in the school-rooms will help to rule this country in a few years. They have been getting no training for this responsible work. Is it not just as important that they should learn how to be citizens as it is that they should learn how to spell, or to calculate percentages? A citizen must be a citizen all the time, and he is not always spelling or calculating percentages.

An idea which came to a man

Then an idea came to one of these men while he was thinking over the question. Why not organize the school-rooms as school cities, or school states, or school republics, and allow the pupils to learn how to govern themselves? Many people thought the man who first suggested the idea had lost his wits. They said that there would be so much disorder that the school could not go on, and that no child would learn anything at all. Some people simply laughed at him. They had the idea that children are naturally bad, and like to do wrong.

The man did not mind their laughter, and would not stop talking about his idea. At last he got the managers of some schools to agree to try the plan. They allowed him to tell the children what he had in his mind, and the pupils were eager to join with him when they heard the explanation. A sort of constitution was drawn up, elections were held, the school cities were organized, and set to work. None of the dreadful things that people had feared came to pass. The children took more interest in their schools than ever before, had better lessons, and behaved much better. The teachers had an easier time, and the children were happier in school than they had been under the old plan.

THE OFFICERS ELECTED IN A SCHOOL CITY

One of these school cities elected only a mayor, a chief of police, a judge, and a health officer. As the school was small, all sat together to make the laws, which are only rules. They talked over the things which ought, or ought not to be done, and voted on them. If a majority voted for them they were written down, and all understood that they were to obey them. In a republic the majority must rule. If any one disobeyed, the chief of police arrested him and brought him before the judge. Witnesses were called and the judge listened to them. Then he decided upon the punishment.

The laws were the simple laws of good conduct which all the children knew, even if they had broken some of them sometimes. They had laws about order in the halls, about marking on the walls, about behavior on the playground. They made laws about neatness of desks, and about neatness of person, and appointed inspectors to see that they were obeyed. Some school cities make laws about cheating, about lateness, and about telling lies. Some cities have made more rules than the teacher had made, and have obeyed them better too.

If a policeman saw a boy about to break any of the laws, it was his duty to go up to the offender and warn him to stop. Usually this was enough, but sometimes the boy or girl would keep on in spite of the warning. The policeman would then order him to appear before the judge at a certain time and would tell the witnesses to be present. The judge would then ask the policeman what he had seen, and would ask the offender what he had to say for himself. After hearing what the policeman, the witnesses and the offender said, the judge would decide whether or not he was guilty.

HOW THE JUDGE PUNISHED THOSE WHO HAD DONE WRONG

Punishments in a school city are of various kinds. Sometimes the judge reprimands the offender before the whole school. No citizen likes that, of course, and often it is enough to make him do better in the future. Sometimes he is shut out of all the games for a certain time. Sometimes he is ordered to apologize in public for his rudeness. If he has destroyed property, he must make good the loss before anything else can be done. If a boy or girl has done anything very bad, he or she may be deprived of a citizen's rights in the republic. This is one of the most serious punishments. It means, of course, that he no longer has a vote in the affairs of the republic, and can hold no office.

Many school republics were founded after the first ones, and some judges have ordered all the citizens not to speak to some one who had been guilty of a very serious offence and did not seem to be sorry for it. It has been found that this is the most severe punishment that can be inflicted. It is said that no boy has been able to endure being cut off from his fellows for more than one week.

The most interesting thing about the whole matter of punishments is that little punishment has been found to be necessary. When boys and girls feel that they have had a part in making the laws, they also feel that they ought not to break them. Many boys, who had been troublesome to their teachers in many ways, became model citizens after the organization of the school republic. Public sentiment looked upon a law-breaker with disfavor. The citizens felt that one who did not obey was really harming every one of them. This is what every good citizen should feel about breaking the law.

DIFFERENT FORMS OF GOVERNMENT IN SCHOOL REPUBLICS

Such a form of government as this, where every one has a direct voice in making the laws, is called a pure democracy. It works very well while the number of citizens is small, but does not work so well where it is very large. In a very large school it is necessary to organize each room as a ward in the city, and to elect one, two, or three aldermen from each. These aldermen meet together to make the laws for the school city. They represent the pupils, and so we call this a representative democracy. There would be one mayor, and one chief of police for the whole school.

Of course, in a large school city there would be need for more than one judge, and for several policemen, health officers, inspectors and the like. They are sometimes appointed, by the mayor, and sometimes elected by the citizens. Their duties would be the same in either case. In large school cities a district attorney might be necessary. This officer always represents the people in court. It is his

business to state the case for the people when any one is accused of doing wrong.

WHAT POSITION HAS THE TEACHER IN A SCHOOL REPUBLIC?

Some one may inquire if the teacher has anything to do with the government of a school republic. Can he or she have nothing to do with the government of the school? It is always understood that the rights of the teacher are still there. He simply delegates some of them to the pupils. First, he must approve the charter or the constitution under which the school republic works, and sometimes the charter provides that he may veto, that is, forbid, any law, or that a law may not go into effect until he signs it.

Some one made this comparison. The position of the teacher and the school board, or the school trustees, is like that of a state government, while the school republic is like that of a city in the state. A city has a charter giving it some rights of government and the power to do certain things. So long as the city does not abuse these powers, the state government does not interfere. If it does misuse its powers, the state steps in to stop it, and can take the powers away, or change them as it sees fit.

THE DIFFERENCE BETWEEN A SCHOOL CITY AND A SCHOOL STATE

In a very large school, or in a small city where there are several schools, a school state is often organized. Here each school keeps the officers it has and makes some laws for itself, but elects representatives to the school legislature to talk over the matters of all the schools, and to make laws which apply to all of them. All the schools have some of the same laws, and the conduct in all the schools may be more nearly the same. A school state must have a governor, of course. In a real state he is chosen by all the citizens. If a school state should be organized we could say that the position of the teacher and school board was similar to that of the president and Congress.

Of course girls as well as boys must be citizens of the school city or the school state. They are quite as important in school as the boys are, and should have equal rights. Women are voters in many states now, and before very long they will be voters in all the states, and it is quite as necessary for girls to learn to rule themselves as it is for the boys. In some school states girls have been elected mayors or judges and have made good officers.

WHAT BOYS AND GIRLS LEARN FROM THE SCHOOL REPUBLIC

What is the use of all this? In the first place it makes the children happier, and more contented, and that is something. They behave better, they learn how government is carried on, they learn a very important lesson, which is that in a republic the majority must rule; they learn the duties of the different officers in a city or state, and they soon discover whether or not an officer is doing his duty. They learn why laws are made. All of these things are good training for them.

The idea of the school republic has spread to other lands. When General Leonard Wood was governor of Cuba, he appointed Mr. Wilson L. Gill, the author of the school republic idea, to supervise the training for citizenship in the schools of that island. School republics were organized in each of the three thousand, six hundred schools, with excellent results. Though the Republic of Cuba, when it took over its own affairs, did not feel that it could appoint an officer to continue the work, many of the schools in Cuba yet use the plan.

SOME PLACES WHERE THE PLAN HAS BEEN TRIED

In the United States it is in use in some of the Indian schools with excellent results. The Indian boy or girl has not had even as good an opportunity as the white child to learn the duties of citizenship. Indians have not been allowed to become citizens until recently, and so their parents could teach them little on the question. In far-away Alaska there are school republics both in the white schools, and in those where the little Indians and Eskimos are taught. The idea has found favor in Japan. There are school republics in several countries of South America, in Hawaii, in South Africa, and in some of the European states. In fact it is difficult to find a country where there are not a few. Unfortunately many parents and teachers are afraid to introduce the idea. Parents were brought up under the old system, and many have forgotten that they were ever children; and the teachers fear that the plan will not work, because it is so different from the methods they know.

THE END OF THE BOOK OF KNOWLEDGE.

GENERAL INDEX TO THE BOOK OF KNOWLEDGE

For titles of poems or first lines see Special Poetry Index following the General Index. Author's names are in both the indexes.

THIS Index, containing about twenty-five thousand entries, will enable you to find very quickly everything contained in *The Book of Knowledge*. It is not arranged exactly like an ordinary index, for *The Book of Knowledge* is not like any other book in the world. The book does not contain all the accumulated knowledge of the ages, but *those things which it is most important to know*, arranged so that they can be quickly and easily understood. Like an ordinary index, it is arranged alphabetically.

Many subjects are indexed twice or even three times. For example, you wish to know something about the Sun: look for the word and you will find dozens of references to the Sun and its work. Under the word *Earth* you will easily find the story of the Sun and the Earth together. You will find Hockey in its place under the letter *H* and also under *Games*. You will have little trouble if you think for a second before you look.

The Special Poetry Index will prove a great help. The names of the authors are in the General Index under their proper letters. They are also found in the Special Index and under each name are the titles of the poems by that author. Suppose you do not know an author's name: the titles of the poems are given in their proper place according to the first important word, and the first lines according to the first letter of the first word.

The book contains nearly ten thousand pictures, and, of course, only the most important could be indexed separately, but you will have little trouble in finding what you want. Almost every article is illustrated, and if you look in the index for the most important word in the subject you are likely to find pictures on or near the pages to which you are directed.

Think of what you want and look under the most important word. If you want a person, look under his name; if you want a country, look under its name. Everything is indexed under the word you are most likely to think of. For Poetry, see the Special Poetry Index.

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